RUBBER WORLD

SERVING THE RUBBER INDUSTRY SINCE 1889

MAY, 1960

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RUBBER WORLD

ARTICLE HIGHLIGHTS

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VOLUME 142, NUMBER 2 MAY, 1960

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Cover photo: Courtesy of Godfrey L. Cabot, Inc., Boston, Mass.—a photomicrograph (oil immersion objective at very high magnification) showing black cloud (carbon gel) grain in well-dispersed rubber stock. (See abstract of paper by A. Medalia, page 89.)

The opinions expressed by our contributors do not necessarily reflect those of our editors

FEATURE DEPARTMENTS

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NEWS of the RUBBER WORLD

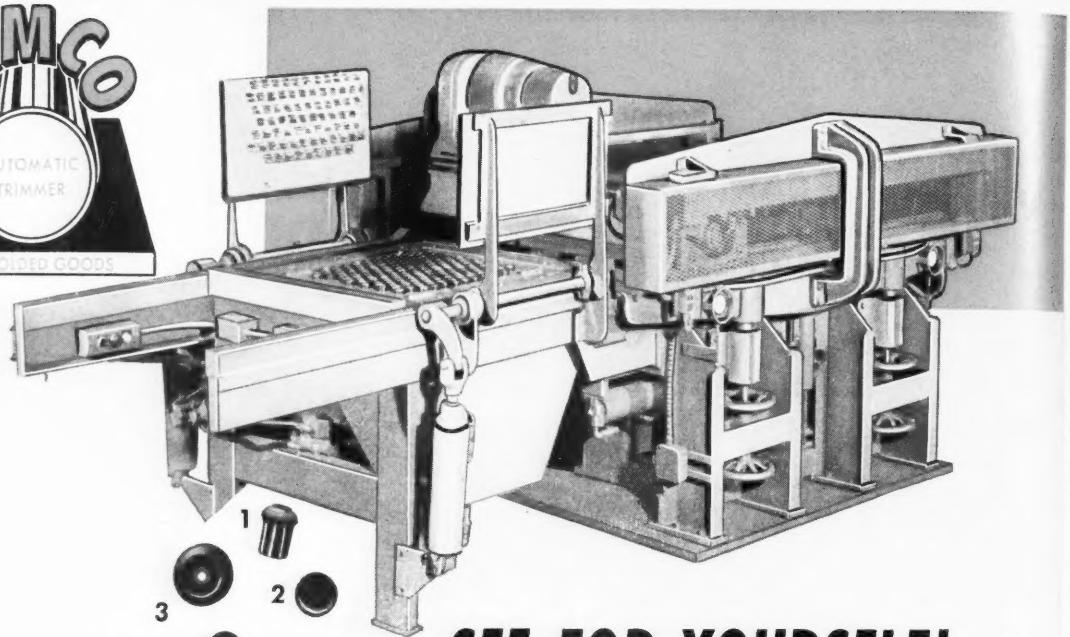
United States-Europe exchange of technical information which has been receiving considerable thought and implementation in recent months has had a substantial boost from United States Rubber Co. with the assignment of senior scientist and former RUBBER WORLD advisory board member, Philip D. Brass, to Paris. Dr. Brass will supervise the company's plans for aiding engineering and scientific research in Europe and will inform the company of developments as they take place in Europe.

Research and development in carbon black types and uses continue to make news. Columbian Carbon Co. announces a new series of oil furnace blacks called Neotex 100, 130, and 150, with low structure for better ride and wear which have been developed at the fairly recently completed research and technical service laboratory. As we go to press, United Carbon unveils its service laboratory. Following last month's introduction of the Regal blacks by Cabot, it looks like the carbon black industry is not content to stand pat on past performance.

The export of synthetic rubber from the United States to Europe may not decline as much as had been predicted with the coming on stream of European synthetic plants. With current exports high, European economic activity expected to be extensive, and a duty-free status for synthetic rubber to the Common Market area, every indication is for continued high level of shipments.

The rubber industry in Canada seems to be healthy and expects to stay that way during the Sixties. A record attendance appeared for the Rubber Division, CIC, meeting at Kitchener to hear first-hand information on new polymers and remained to hear L. E. Spencer, Goodyear Canada president, predict very promising activity during the new decade, in an address before the Ontario Rubber Group.

FEMCO
AUTOMATIC TRIMMER
FOR MOLDED GOODS



SEE FOR YOURSELF!...

...The remarkable job this machine does trimming all types of molded rubber goods

FEMCO's Standard Automatic Trimmer is the fastest, easiest and safest mechanical method of trimming molded rubber goods available today. Every 10 seconds — or less on some applications — this machine will trim an entire sheet of molded parts right from the mold. It will do it around the clock, day in and day out, with a minimum of maintenance.

Trimming is done by a traversing steel roll that compresses stock against steel rule cutting dies. This method of line contact cutting — exclusive with FEMCO — gives more lineal inches of usable die area than is possible with any other trimming device of comparable price.

Illustrated here are some of the many, many different molded rubber products now being trimmed on FEMCO's Standard Automatic Trimmer. Figure how many pieces you're trimming now and compare it to what the Standard Automatic Trimmer is doing. You'll readily see how this machine can cut your costs and increase your profits.

1. Crutch Tip
   144 cavity die; 20,000 per hour
2. Brake Cylinder Cup
   219 cavity die; 29,500 per hour
3. Brake Cylinder Boot
   100 cavity die; 10,000 per hour
4. Brake Cylinder Boot
   221 cavity die; 16,000 per hour
5. Golf Ball Center
   324 cavity die; 40,000 per hour
6. Bumper Washer
   192 cavity die; 8,000 per hour
7. Emergency Brake Pedal
   81 cavity die; 10,500 per hour
8. Toy Wheel
   81 cavity die; 10,000 per hour
9. Baby Bottle Nipple
   221 cavity die; 21,000 per hour
10. Door Stop
    30 cavity die; 7,000 per hour
11. Tire Boot
    84 cavity die; 20,000 per hour
12. Pan Scraper
    24 cavity die; 3,000 per hour
13. Gasket
    12 cavity die; 1,200 per hour
14. Gas Pedal Pad
    25 cavity die; 3,700 per hour
15. Power Brake Pedal
    36 cavity die; 4,800 per hour
16. Gasket
    14 cavity die; 1,800 per hour
17. Brake Pedal
    36 cavity die; 4,800 per hour

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NEWS from ABROAD

Latex Cord Dip Studies Reported

Studies are reported by S. A. Vasileva and others[1] on the effect on the properties of cord dipped in butadiene styrene latices of: (1) amount of substance deposited on the surface of the cord; (2) drying time and temperature of dipped cord; (3) variation in length and width of cord after it has been dipped and dried. One of these factors at a time was varied in each test, and moisture content of the dipped cord, the weight gain or "pick up" (the amount of solids from the dip deposited on the cord), the cord/rubber bond strength, and mechanical properties of the cord were determined in relation to these variations.

Rubber/cord bond strength proved to be considerably affected by dipping time and squeeze roll pressure; weight gain and bond strength both fell with reduced contact time and increasing roll pressure; bond strength depended directly on weight gain. Drying time and temperature depend directly on the composition of the dip. Thus with latex-resorcinol-formaldehyde compositions, variations in these factors directly affect rubber/cord bond strength, but this property is not affected when a latex-albumen dip is used; only moisture content changes.

A table sets forth the conditions recommended for dipping and drying viscose, cotton, and polyamide cord in latex compositions.

[1] *Soviet Rubber Tech.*, Jan., 1960.

Malaya Studies Need Of Rubber Market

The outside world could have had very little idea that Federation rubber traders and brokers were even vaguely desirous of having their own market in Kuala Lumpur, until the deputy chairman of Lewis & Peat, Ltd., London, England, publicly drew attention to the matter while on a visit in Malaya last December. Then quite suddenly, it seems, the feeling crystallized that the Federation of Malaya, as the world's largest producer of natural rubber, should no longer depend entirely on Singapore, but should have its own exchange. Whereupon the Federation Government decided that the establishment of a rubber exchange in the Federation is essential: it announced that it would support such a market and would, if necessary, introduce legislation to enable it to function efficiently.

A committee of government officials and representatives of all sections of the rubber trade will shortly be appointed to study what form of organization and legislation is most desirable and will report accordingly.

Experts here seem to favor an exchange — with headquarters in Kuala Lumpur — patterned after the London exchange where all transactions are completed centrally. They suggest that all rubber transactions be made through the exchange, that it have its clearing house which would guarantee the fulfilment of contracts, and that the government back the clearing house rules of contract by the application of statutory powers. The Singapore rubber market, it may be added, has no statute to support it. These experts further emphasize that it does not matter if rubber continues to be shipped through Singapore, but all transactions must be completed in the Federation. As port developments progress, however, it is to be expected that increasing quantities of rubber will be shipped from Federation ports.

It is hoped that an exchange, as envisaged, will be able to guarantee quality and standards that will be laid down, and probably will also tend to curb wild speculation.

French Butyl Rubber Plant in Operation

France, the biggest consumer of butyl rubber after the United States, established the first butyl factory outside of North America and began producing early in 1959. The factory has an annual capacity of 20,000 tons, which it expects to reach this year. Details of butyl rubber consumption and development work in France, reported by A. Delalande,[1] indicate that the use of butyl rubber here rose from 5,201 metric tons in 1953 to 9,900 tons in 1958. Because of the world shortage of butyl rubber last year, final figures for 1959 are not expected to show much, if any, change from the 1958 level. In the latter year, inner tubes accounted for 83.6% of total butyl consumption; the remainder went into cables (8.6%) and industrial rubber goods, and others (7.8%).

Butyl rubber is making rapid headway in these two fields of application, particularly in the cable industry which, though only experimenting with this rubber until late 1956, is expected to take 2,000 tons of the 12,000 tons, estimated as total French butyl rubber consumption in 1960; industrial rubber goods and others will account for 1,800 tons, leaving 8,200 tons for inner tubes. Experiments to find new outlets for butyl are going on in French laboratories and factories; recent developments include cold vulcanizing paints for protecting iron, wood, and concrete chemical installations and containers; for these a bright future is predicted in naval construction. Experimental-scale production has begun on aqueous suspensions of butyl rubber for coating and impregnating fibrous materials; on butyl/bitumen compounds for use in building; butyl plasticizers for polyethylene; cellular butyl rubber; and butyl rubber adhesives.

[1] *Rev. gén. caoutchouc*, Dec., 1959, p. 1841.

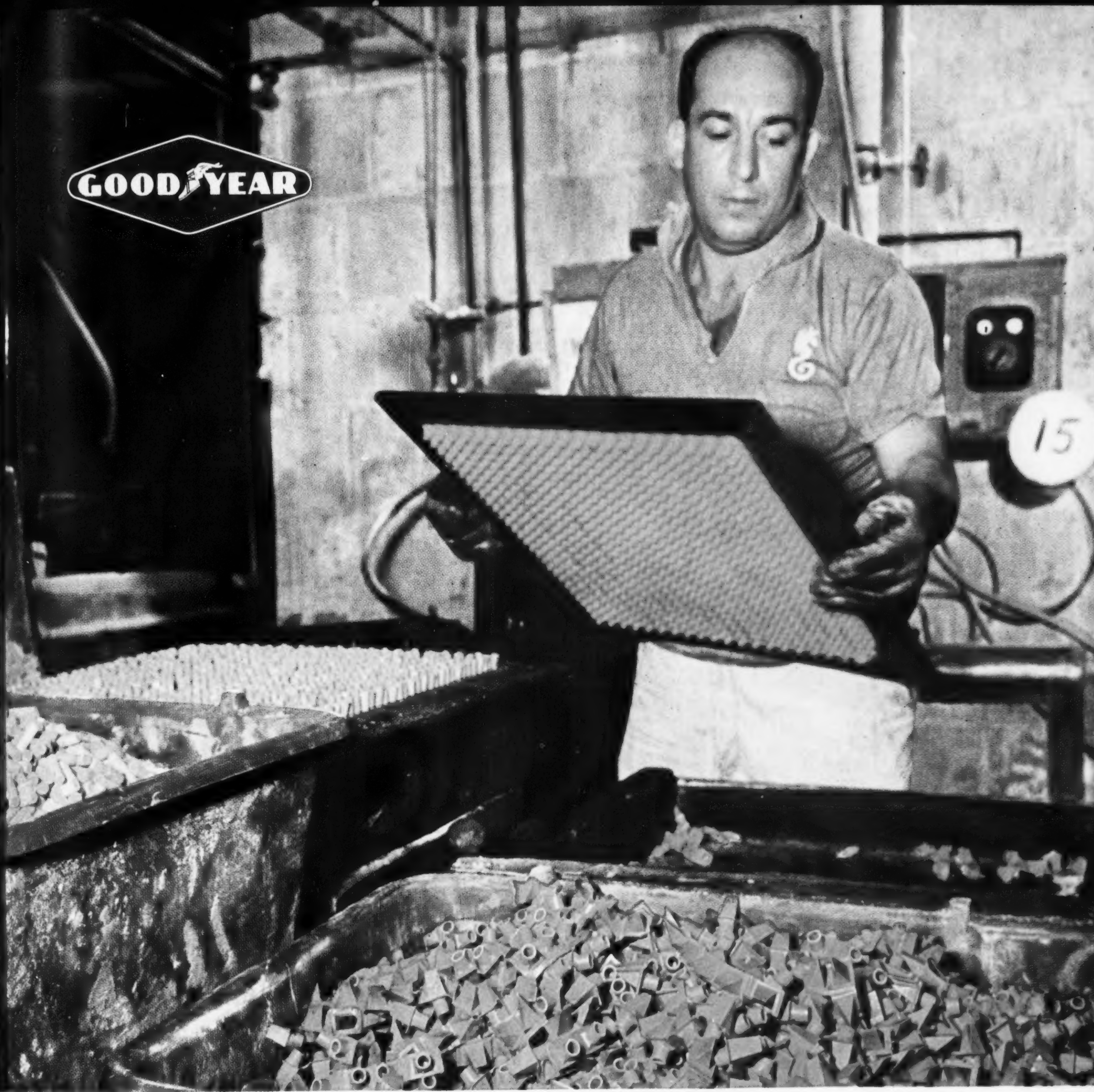
Russia To Upgrade Retread Quality

Because of outmoded methods and equipment in all Soviet retreading factories, retreaded automobile tires usually only give 8,000-10,000 km. against an average of 40,000-50,000 km. in West European countries. Obsolete molds, Vitacap-type vulcanizing chambers, VP-type retreaders are used; tires brought in for retreading are often very badly worn; buffing tools leave deep grooves and ragged cuts on surfaces; in many factories, new treads are rolled on by hand, and there is no control of dimensions; vulcanizing and drying conditions vary.

Following experiments conducted by the Scientific Research Institute of the Tire Industry and at repair shops in Moscow, Kiev and Tiflis, during 1957-58, and continued in 1959, new procedures have been laid down, according to E. G. Vostroknutov and N. M. Bodak.[1] Ultrasonic equipment for detecting defects is recommended; moisture content of tires to be retreaded is to be determined to insure proper drying; and a recently developed hygrometer which measures the electrical resistance of the carcass in relation to moisture content is to be mass produced and supplied to all repair works

(Continued on page 16)

[1] *Soviet Rubber Tech.*, Jan., 1960.



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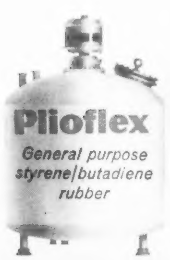

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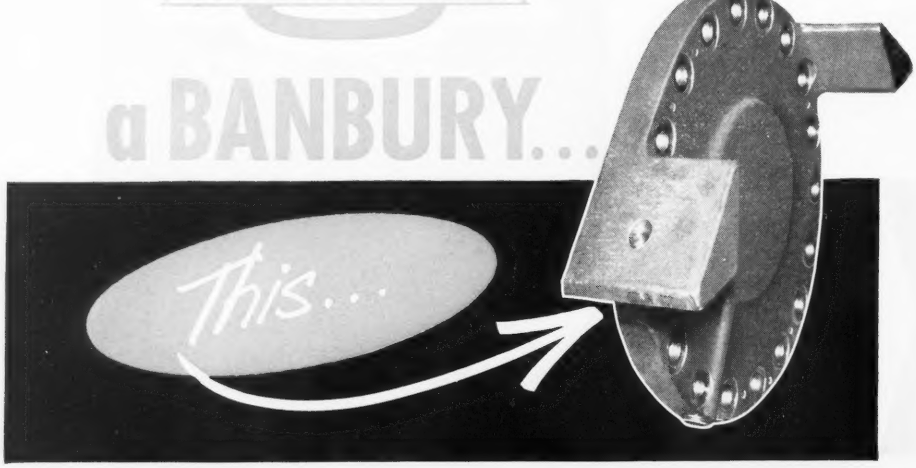

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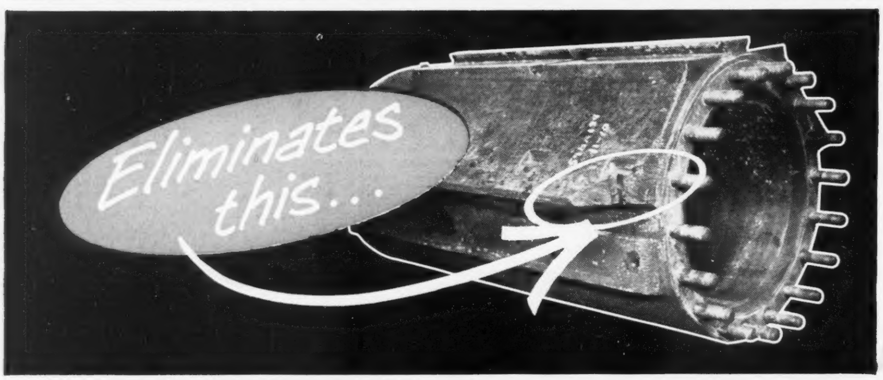
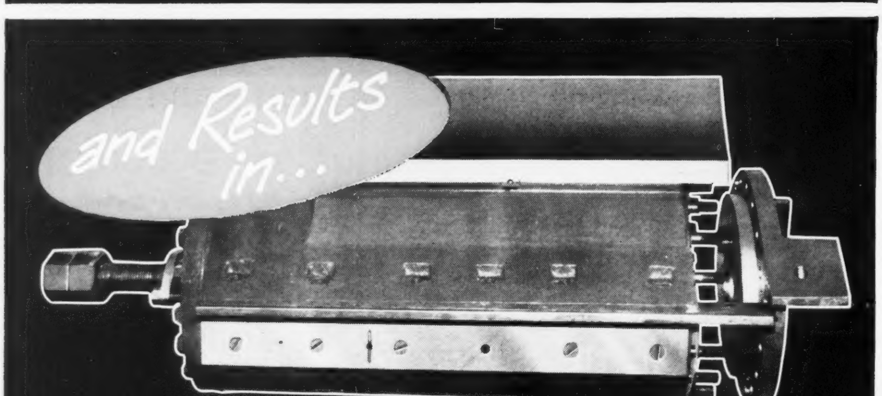


Broken gib-fin extensions on sliding door cylinders



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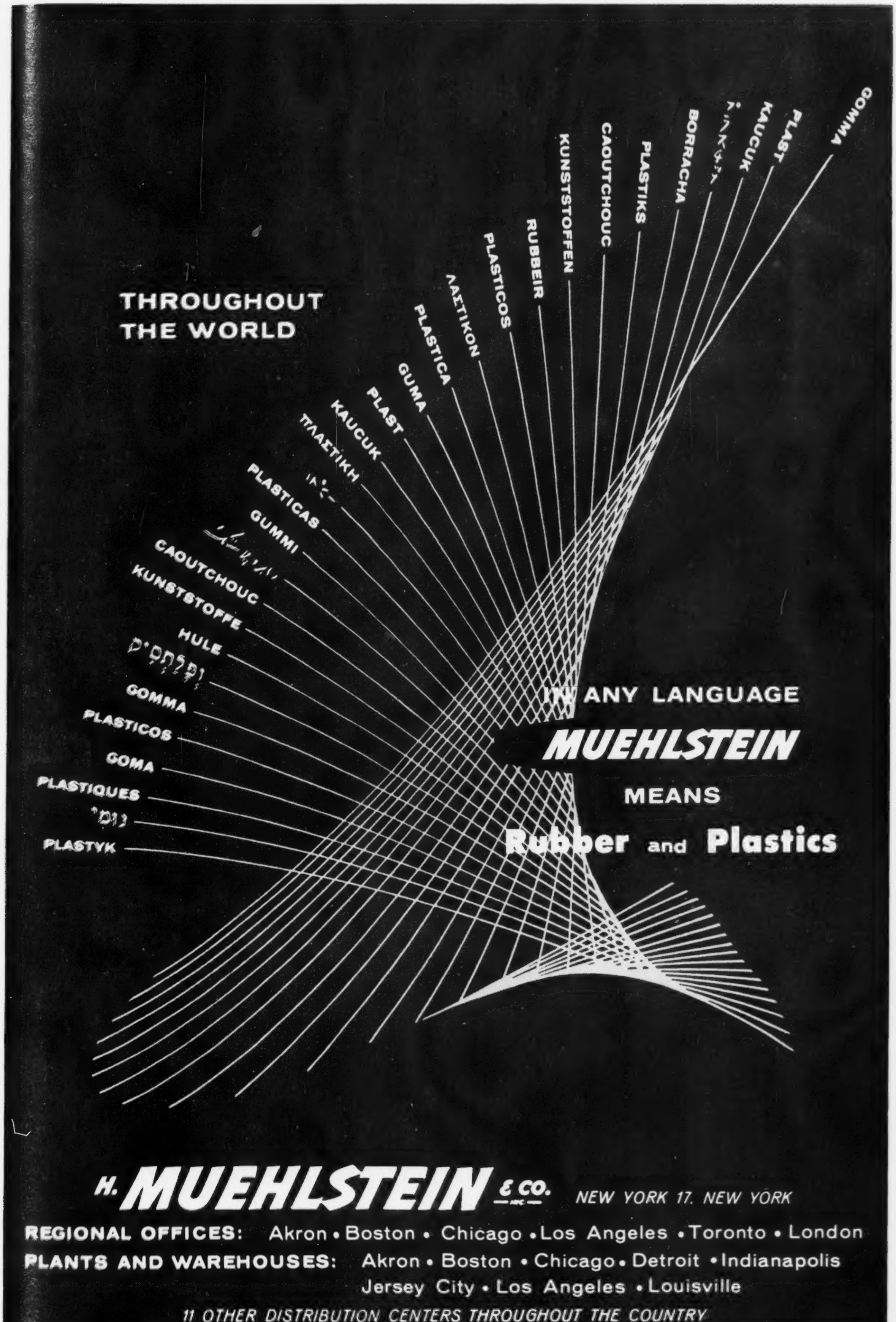
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11 OTHER DISTRIBUTION CENTERS THROUGHOUT THE COUNTRY

News from Abroad

(Continued from page 10)

and motor fleet depots; buffing is to take place in two steps — a rough buffing followed by fine processing with a round wire brush: bilateral heating and pressure increased to 15-20 atm. are recommended in curing.

In tests, tires retreaded with high-grade material and cured with pressure of 20 atmospheres in airbags with bilateral heating ran for 35,000-40,000 km.; whereas tires retreaded by the usual methods gave 15,000-16,000 km. (when high-grade material was used) and 8000-10,000 km. Unilateral heating may be used in the "bandage" method of vulcanizing tires, if they have no continuous local defects.

New Research Plans Not So New

"It is very satisfying to know that at last a full program of research and development work will go ahead, and much credit is due to Sir Geoffrey Clay, who has put the finishing touches to many proposals too long in abeyance and has introduced some very forward-looking steps of his own. But it is a little discouraging to those who have worked for many years in the industry to feel that the plans that have now been adopted could have been put into effect five years ago, or even earlier," C. E. T. Mann, retiring director of the Rubber Research Institute, is quoted in the *Malay Mail* as saying on the eve of his departure from Malaya, while commenting on the future development of the RRI.

He was referring to plans "not so very different from those that have at last been adopted" that had been submitted to the Rubber Producers' Council by the RRI as early as 1953. He recalled that the Blackman Committee—whose report in 1957 provided the necessary goad to the rubber industry—was appointed as a result of recommendations by the Institute; further, that a proposal by the Rubber Producers' Council in 1954 to increase the research cess had been defeated by the attitude of the leaders of the planting industry, who considered an increase unnecessary. Mr. Mann added that even now he felt that not enough was being spent on many important aspects of biological and technological research for the industry.

Warns Against Complacency

Referring to the smaller estates in the Federation, which cover more than 500,000 acres, Mr. Mann stated that these were more backward than the smallholdings, usually — mistakenly — regarded as the least efficient section of the industry. The smaller estates have made little or no use of the Institute's services and have done little replanting to speak of.

His comments of Indonesia are worth noting, as he warns against overconfidence in Malaya's present lead as the world's top rubber producer.

"The rubber research scientists in Indonesia deserve 100% credit for the work they have done," he is quoted as saying. "The flow of new developments has slowed down, but I think it is just a temporary phase. . . . they still know how to grow rubber. And . . . they will always have an advantage over us in possessing some of the most fertile soils in the world.

"Malaya should not shout too loud about her success. Indonesia's potential is well ahead of her present rate of production."

Mr. Mann came to Malaya in 1927; a war prisoner during the Japanese occupation, he became director of the Institute and chairman of the board in 1946. In 1952, the Institution of the Rubber Industry awarded him the Colwyn Gold Medal, in recognition of his outstanding services in research.

Replanting by Smaller Estates

What Mr. Mann says about replanting by the smaller estates is well illustrated by the accompanying table, compiled by the RRI from the "Malayan Rubber Statistics Handbook for 1958," which shows the use made of high-yielding material by estates of various size groups:

Size Group (Acres)	Total Acreage Planted	Group Acreage as % of Total Estate Acreage in Malaya	% of Group Acreage under: Mature Unselected Seedlings	Mature High-Yielding Material	Immature High-Yielding Material
Under 500	303,000	15	69	17	14
500-1000	217,000	11	52	27	21
1000-2000	431,000	21	43	31	25
2000-3000	271,000	14	40	35	25
3000-5000	377,000	19	40	35	25
5000 over	389,000	20	33	44	22

The slow rate of progress in replanting by the generally Asian-owned smaller estates, and especially those under 500 acres, is abundantly clear from these figures. The explanation is connected with the discovery made by the newly introduced Advisory Service of the RRI for estates that a large number of those in these categories did not even know of the existence of the RRI, and that in very many cases they would in any case not have been able to utilize the information available, because it is in English, and managers knew only Chinese. The RRI is therefore planning to produce a Chinese version of the *Planters' Bulletin* before the end of 1960.

Pelletized News

The Rubber Manufacturers Association, Inc., New York, N. Y., U.S.A., has called an international conference in Singapore on September 12 to eliminate the existing overlapping of grades of rubber and to replace them by internationally agreed standards. Hosts of the conference will be the Singapore Chamber of Commerce Rubber Association; the Rubber Trade Association of Singapore, and the Federation of Rubber Trade Associations of Malaya. A working group of grading and quality experts from several countries will meet in Singapore a week before the scheduled date and will make their findings available to the conference.

CABLE BELT, LTD., Inverness, Scotland, reports that what is believed to be the longest single-flight rubber conveyor belt has been operating continuously for the last 12 months in Australia. This rope-driven cable belt conveyor exceeds by 700 feet a belt made by B. F. Goodrich Industrial Products Co., Akron, O., which is in service at Ada, Okla. Both the Ada belt at 12,000 feet and the Australian belt at 12,700 feet are exceptional examples of modern engineering in belt technology.

B. F. GOODRICH AUSTRALIA, PTY. LTD., began tire production early in January at its new factory, near Melbourne, Victoria. Daily output capacity is put at 1,000 tires, and distribution was to start in March, 1960.

A new chemical company has been jointly formed in the Netherlands by the Neville Chemical Co., Pittsburgh, Pa., U.S.A., and Teerunie N.V., Uithoorn, Netherlands. To be known as Neville Cindu Chemie N.V., the new firm will make hydrocarbon resins and solvents for the entire European market, in a factory under construction in Uithoorn and is expected to begin operating shortly. The company's products will be used in the floor tile and rubber industry, as well as in the paint, printing ink, and various other chemical industries.

MACROMOLECULAR CHEMISTRY is the topic of the international symposium to be held in Moscow, June 14 to 18, 1960. There are to be plenary sessions as well as meetings of sections. Technical sessions will cover synthesis of polymers, polymerization and polycondensation reactions, and chemical transformations in polymer chains.

(Continued on page 20)


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MAKING THE BEST TODAY STILL BETTER TOMORROW

News from Abroad

(Continued from page 16)

WITCO CHEMICAL CO., LTD., London, England, a wholly owned subsidiary of Witco Chemical Co., Inc., New York, N. Y., U.S.A., plans the construction of a synthetic rubber latex plant at a 20-acre site in the midlands of England. On-stream operations are scheduled to begin in early 1961, with an initial annual capacity of eight million pounds dry weight. The output—a complete line of styrene-butadiene, high styrene, nitrile, and other acrylic types of latices—will be sold to the textile, paper, rubber, plastic, and allied industries. The subsidiary maintains headquarters in London and sales offices in London and Manchester and Glasgow, Scotland.

THE RUBBER PRODUCERS' COUNCIL OF MALAYA has appointed Inche Abdul Jalil bin Haji Aminudin chairman to succeed A. W. Goode. Inche Jalil, who is speaker of the Negri Sembilan State Assembly, was vice chairman of the Council last year and also chairman of the Council of Malayan Smallholders' Associations. The new vice chairman is J. Brown, and R. Fletcher is secretary. At a press conference Inche Jalil declared that the research program recently announced by the Controller of Rubber Research, Sir Geoffrey Clay, had the full backing of the Rubber Producers' Council.

THE NATIONAL UNION OF PLANTATION WORKERS OF MALAYA has proposed a scheme to collect millions of dollars from plantation workers with which to buy estates. A thrift and loan fund would be set up into which workers would put a minimum of \$1.00 (Straits) a month. They expect to collect at least \$2,000,000 (Straits) in the first year, but no loans would be made during the initial period in order to permit the accumulation of capital. After a few years, the fund would have millions of dollars on hand with which rubber estates would be bought and run by the Union on model lines. It seems that representatives of thousands of workers have already pledged their support.

SUMITOMO ELECTRIC INDUSTRIES, LTD., Osaka, Japan, is to acquire about 29% of the shares in Dunlop's subsidiary in Japan, under an agreement signed early in February, this year, Dunlop Rubber Co., in London, announced. The issued share capital of Dunlop Japan is to be raised from 500,000,000 to 1,750,000,000 yen, in connection with plans to modernize and expand facilities at Kobe, and the building of a second tire factory, to be ready to operate by the middle of next year. Hitherto Dunlop Japan, which has been manufactuirng rubber goods in Japan for 50 years, has been wholly owned by the parent company.

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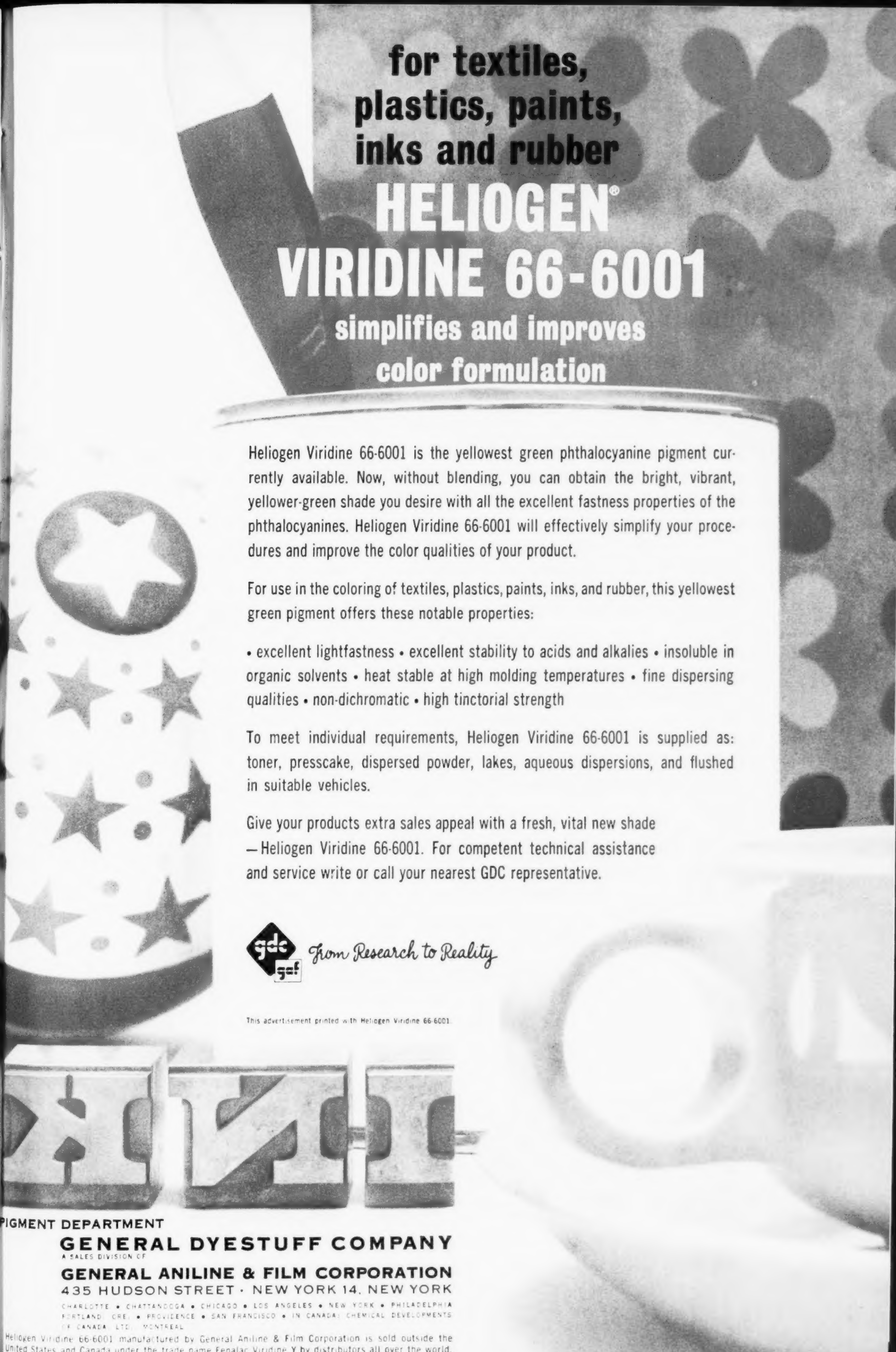
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HOT-TYPE POLYMERS	1006, 1061, 1013	Original SBRs offering easy processability and exceptionally light colors.
COLD-TYPES	1502, 1551	For manufs. who require the special properties and quality offered by cold-type polymers.
COLD OIL-EXTENDED POLYMERS	1703, 1707, 1708, 8200, 8201	For the maximum in high quality at lower cost.

Not the finished adhesive, just the heart of it—the resin—is what we make.

Making an adhesive for tough jobs?

Try adding a pinch of permanence

A powerful grip—tighter than rivets—bonds the brake lining to the brake shoe.

This bond must hold fast despite sudden stops that heat up the lining; despite wheel vibration, driving rain, spattering oil and grease—through weather ranging from subzero cold to superhighway hot.

In millions of cars, the adhesive that does this job is made with a Durez phenolic resin.

We work closely with people who make adhesives for tough bonding jobs. We supply the pinch of permanence—the resin that gives a good adhesive its gripping power, its heat resistance, surface tack, and hardness or flexibility.

We've been specializing in phenolic resins for 39 years; have developed thousands of resin formulations; are constantly developing new ones. If there's a way we can help you solve an adhesive formulation problem, we're eager to know about it. For details on Durez resins and the service that goes with them, write us.

DUREZ PLASTICS DIVISION

205 WALCK ROAD, NORTH TONAWANDA, N. Y.

HOOKER CHEMICAL CORPORATION

HOOKER CHEMICALS PLASTICS

ROYLE STRAINERS MEAN RUBBER PROFITS

Royle 4A Strainer

As an example—Royle Strainers, with new, quick-opening heads, assure much longer production runs than ever before possible and considerably less down-time.

The large screen area gives more production time between screen changes; while the new breech-lock head, with automatic hydraulic-pneumatic operation allows for quick screen changes.

There are many other practical advantages built right in to Royle Extruders, for instance:

Heavy Duty Gear Case—with self-lubricating, opposed helical gears that were Royle designed and engineered specifically for strainer operations.

Powered Cut-Off Knife—with either rotary or up-and-down motion and adjustable cycling to give variable length products.

Longer L/D Ratios—allow mixing operations to be performed in the extruder. This gives a continuous and, hence, more economical mixing method than other operations.

Write today for complete Royle Strainer information. There is no obligation on your part.

ROYLE

Paterson, N. J.

John Royle & Sons, 6 Essex Street, Paterson 3, N. J.

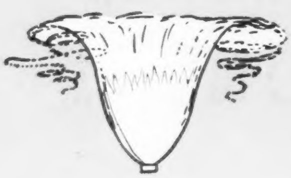
Please, send me full information about Royle Strainers.

Name______ **Title**______
Company______
Street______
City______ **Zone**______ **State**______

JOHN ROYLE & SONS

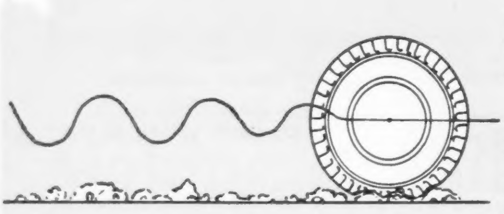
Pioneered the Continuous Extrusion Process in 1880

Home Office, V. M. Hovey, J. W. VanRiper, SHerwood 2-8262. **Akron, Ohio**, J. C. Clinefelter Co., BLackstone 3-9222. **Downey, Cal.**, H. M. Royal, Inc., TOpaz 1-0371. **London, England**, James Day (Machinery) Ltd., Hyde Park 2430-0456. **Tokyo, Japan**, Okura Trading Company, Ltd., (56) 2130-2149.



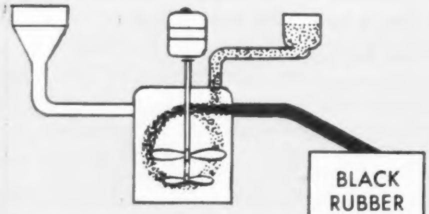
NEOTEX 100

. . . an oil furnace black in the HAF fineness range with lowered carbon structure. NEOTEX 100 develops normal modulus as opposed to the high modulus characteristic of oil furnace carbons . . . produces compounded physical properties comparable to channel black . . . with a cure rate similar to furnace carbons. NEOTEX 100 was created for use in such products as carcass stocks, off the road tire treads and high grade mechanicals.



NEOTEX 130

. . . an oil furnace black in the ISAF fineness range . . . which also produces normal modulus. NEOTEX 130 develops good tensiles, high elongation and lower Shore Hardness . . . properties which may be utilized in passenger treads to provide improved ride and low noise while maintaining a good wear level. NEOTEX 130 may also be used to replace some usage of ISAF and channel to obtain improved properties in natural rubber truck and passenger tire applications.



NEOTEX 150

. . . an oil furnace black in the SAF fineness range with lowered carbon structure. NEOTEX 150 produces the highest tensiles of all available rubber carbons . . . makes possible normal modulus, high elongations and lower Shore Hardness compounds. These properties, in passenger treads, give the best combination of ride, low noise and tread wear. NEOTEX 150 is the tailor made carbon for the Black Rubber process.

NEW PRODUCTS

Rolling Fluid Transporter Tire

The Firestone Tire & Rubber Co., Akron, O., in conjunction with the Army Transportation Research Command, has developed the Firestone Rolling Fluid Transporter Tire with an internal capacity of 521 gallons of fluid. More than five feet tall and 3½ feet wide, the tire was designed to enable the Armed Forces to transport fuel anywhere in the world.

The Transporter carriage consists of an axle and tow bar assembly. Two of the giant tires are mounted on the axle and are hitched by a tow bar to the back of a truck. The tires can be moved on land, sea, or air—giving the Armed Forces greater flexibility. The tires can be parachuted into remote areas or pushed overboard and towed to shore by any amphibious vehicle, reports Firestone.

The tire is undergoing various tests. The tire's neoprene tread and sidewall, when punctured by steel-clad rifle bullets, self-seals, permitting the loss of only a few ounces of its contents of 500 gallons of gasoline. Another phase of testing involves a simulated parachute drop. A new tire will be built, filled with 500 gallons of water, and dropped from a height of more than 12 feet, the equivalent impact the tire must undergo for a successful parachute drop.

Other tests involve a dynamometer run of 2,500 miles at a speed of 20 miles per hour, with the tire being filled with 250 gallons of fluid and subjected to temperature extremes of from −40 to 100° F. Army specifications call for the tire to be towed over hard, level terrain at speeds up to 45 miles per hour in single operations and 20 miles per hour in a train of five trailers, without any adverse effects.

Future applications of this four-ply nylon Transporter Tire include its use as a water container to be towed to remote areas or to help fight forest fires.

New Goodyear Pliogrip Sealants

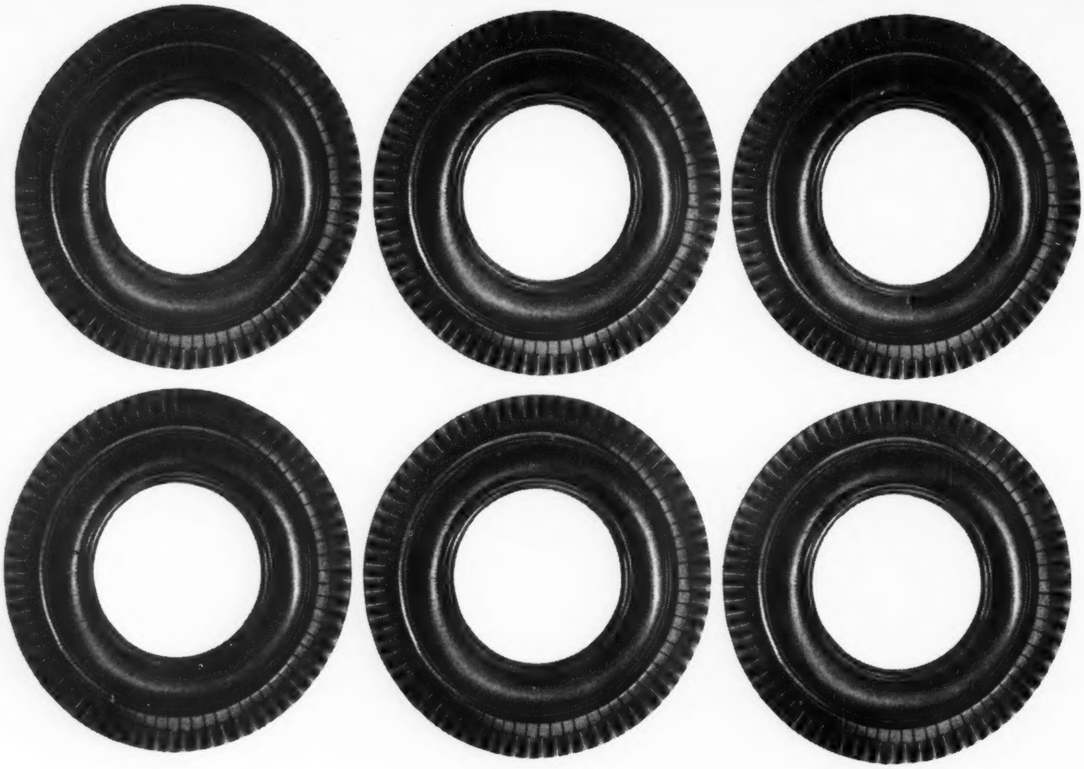
Three new adhesive products that seal, coat, and calk roof gutters, downspouts, metal flashing, and other home and industrial installations have been announced by the chemical division, Goodyear Tire & Rubber Co., Akron, O. Designated Pliogrip 12-1 (seam sealer), Pliogrip 12-2 (protective coating), and Pliogrip 12-3 (calking compound), these adhesive materials have a synthetic rubber base, are aluminum colored, and are said to be highly resistant to weather and aging.

Pliogrip 12-1 is a water sealant that protects against corrosion and deterioration by water, acids, and chemicals. It is designed for use on gutters and downspouts and seal joints in metallic bins, frames, etc. It sets quickly after application, forming a tough, flexible, permanent seal.

The protective coating, Pliogrip 12-2, is applied by brush to gutters, metal flashings, and other metallic surfaces such as corrugated galvanized roofing. This coating is said to form a tough, resilient, crack- and abrasion-resistant coating which holds up against the action of oils, chemicals, and organic acids. It may also be used as a long-lasting and economical auto undercoating.

Pliogrip 12-3 is a filler or calking compound for storm-door and window frames and industrial applications. It is a heavy paste-like material that sets quickly, adhering to metals, ceramics, and wood.

(Continued on page 34)



You get more than a "BAKER'S DOZEN"

Shell manufactures no finished rubber products—only high-quality synthetic rubber and raw materials for the rubber industry

with SHELL's oil-extended rubber

The low cost of Shell's oil-extended rubber offers you even more than the baker's proverbial thirteen for twelve—and you get *high quality* too! Tire treads and swim fins; camelback and floor mats—many products requiring toughness and long wear are made with these economical polymers.

Shell oil-extended rubber is used extensively in *first line* passenger treads and camelback. Accomplishment of such rugged assignments indicates the excellent wearing qualities obtained with these polymers. Long-wearing, high-viscosity rubber hydrocarbon—too tough for processing by itself—is combined with oil at the latex stage and the result is good workability together with outstanding physical properties.

For LIGHT COLOR, try recently improved S-1703 and S-1707. Non-discoloring and non-staining, they are unusually light in appearance. For GREATEST ECONOMY where color is unimportant, Shell offers the following: S-1712 for easiest processing; S-1709 for moderate tack and S-1710 for applications where tack is not required.

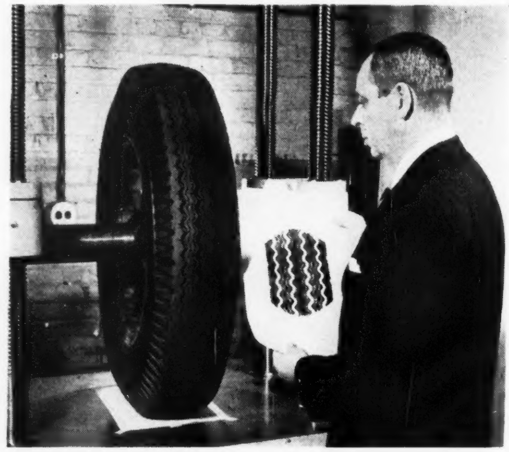
Other Shell S-Polymers include non-extended hot and cold rubber; black, oil-black and resin-rubber masterbatches and hot and cold latices—the widest variety of rubber polymers available from a single source.

SHELL CHEMICAL COMPANY
SYNTHETIC RUBBER DIVISION
P. O. BOX 216, TORRANCE, CALIFORNIA

110 WEST 51ST STREET, NEW YORK 20, N. Y. • 1296 UNION COMMERCE BLDG., CLEVELAND 14, OHIO

New Products

(*Continued from page 30*)



Russel O. Rice, development manager for heavy-service tires, U. S. Rubber, inspects "footprint" made by new Fleet Carrier truck tire

U.S. Royal Fleet Carrier Truck Tire

A new truck tire which is circumferentially slotted, forming an 11-row tread with thousands more "biting" edges than the present conventional five-row truck tire, has been introduced by United States Rubber Co., New York, N. Y. The slotting of this tire marks the first time this important principle of tire design has been successfully engineered into a heavy-service tire, reports the company.

The grooves and traction slots of the new tire, called the U.S. Royal Fleet Carrier, are designed to give full pulling and stopping power and increased protection against sideskidding and jackknifing, two serious problems of the trucker. The new tire is designed for over-the-road transport where greater truck capacities, sustained high speeds, and more severe operating conditions in recent years have put new demands on vehicles, tires, and drivers, reported G. W. Brooks, director of marketing for the firm's tire division.

The Fleet Carrier will be original equipment on 1960 model trucks. It is being made with rayon and nylon tire cords in tubed and tubeless types, and both constructions have rayon or nylon shock pads, respectively, between tire body and tread rubber. The rayon tires are also available with a steel shield—two layers of steel cables embedded in the rubber under the tread as protection against cuts and ruptures.

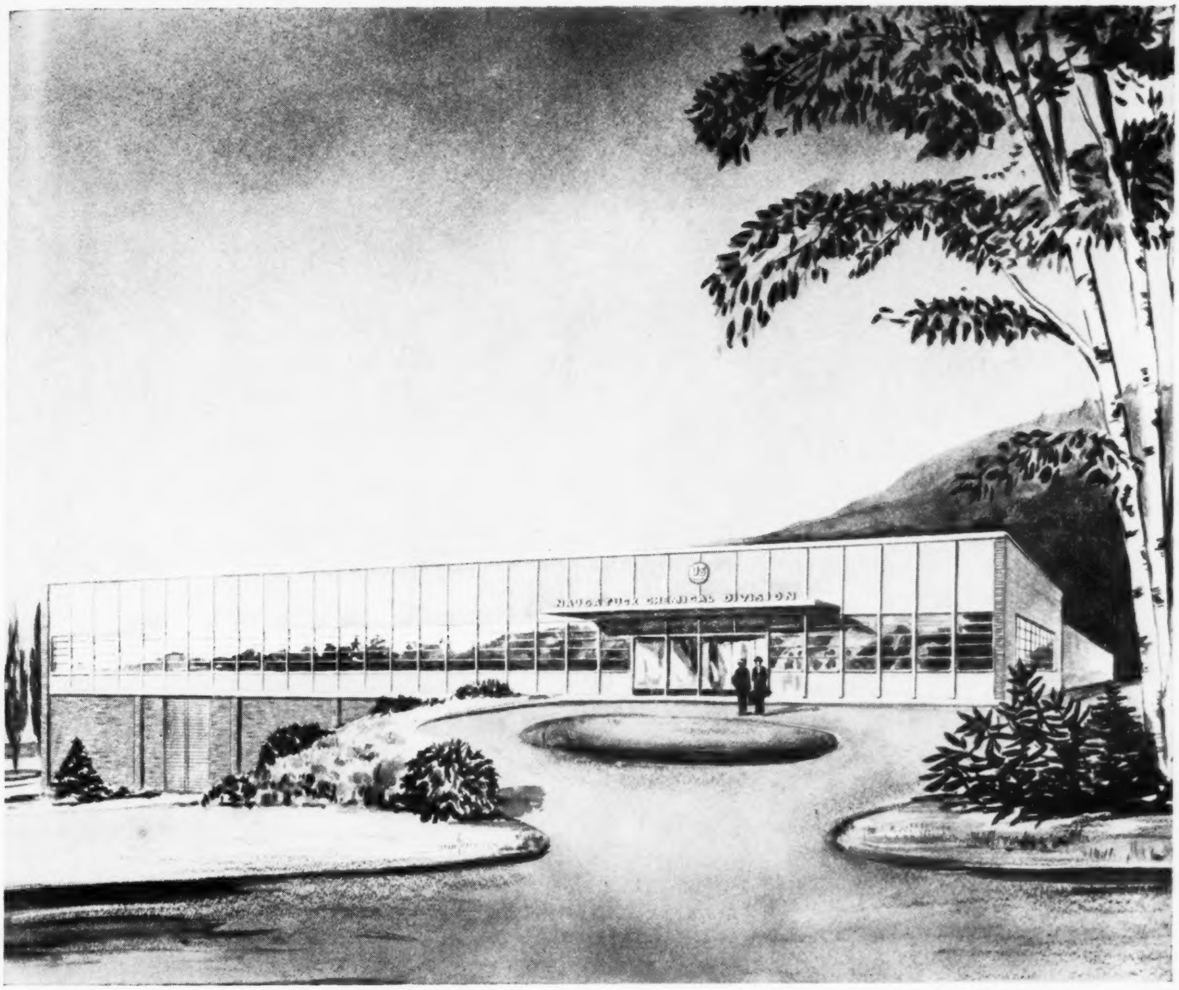
A new type of higher-strength nylon cord with increased stability is being used. Separate molds specially designed for the rayon and nylon tires are used, giving closer dimensional control of both types of tires. In addition, the nylon tires are treated with a tempering process that controls tire growth. Polyisoprene rubber is used to fortify the natural rubber and to reduce heat build-up in the larger sizes.

Custom Electriduct Wiring System

Electriduct division of Ideas, Inc., Laramie, Wyo., is fabricating to customer specifications a complete over-the-floor wiring system, called the "Custom Electriduct." The system permits the use of electrical outlets at various places in the middle of a room. The customer is requested to submit a sketch showing where outlets are needed, and the manufacturer will build the system.

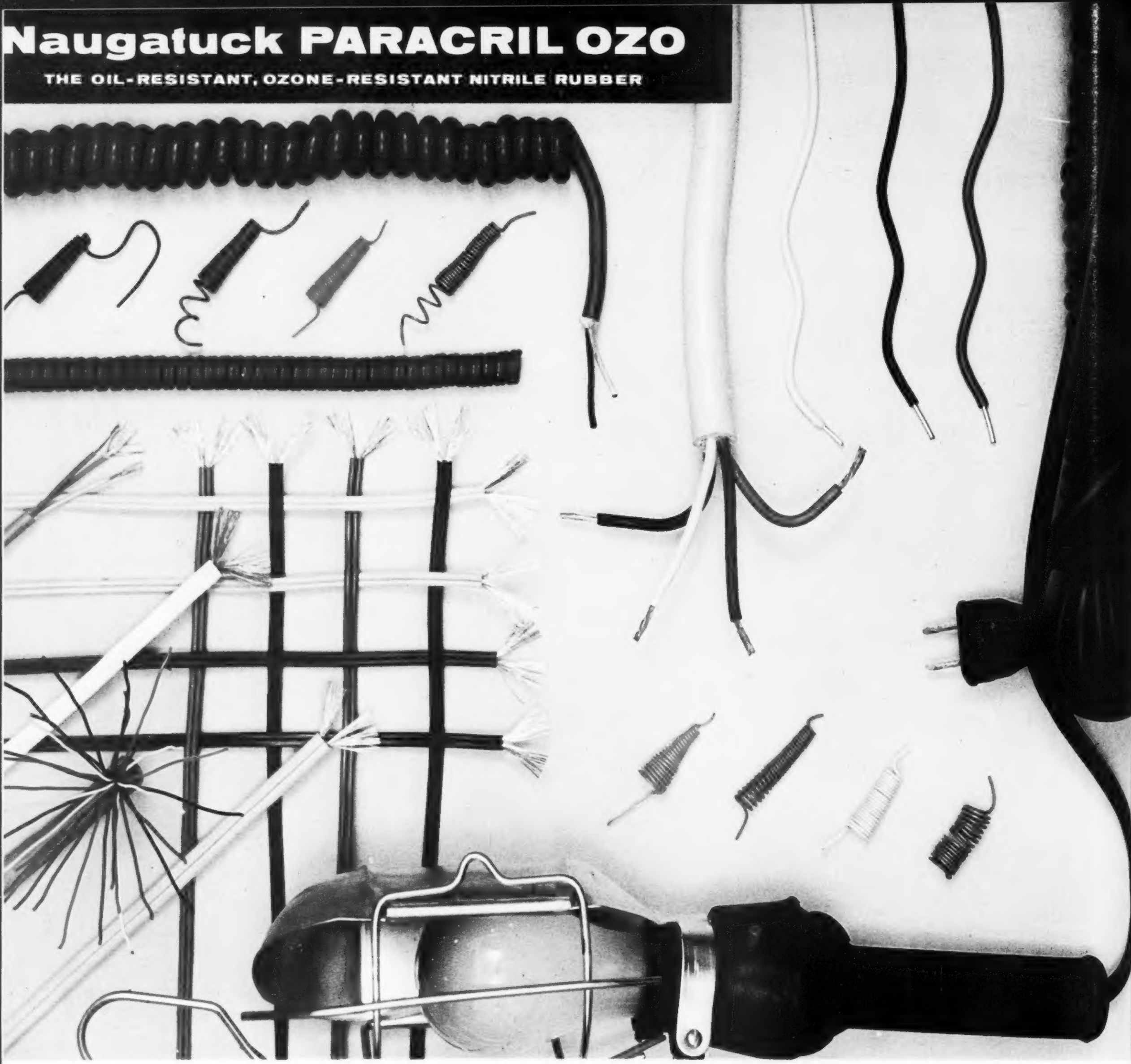
The "Electriduct" consists of a flat rubber-encased wiring said to eliminate tangled extension cords on the floor. "Electriduct" hugs the floor inconspicuously and is stumble-proof, and

(*Continued on page 50*)



Naugatuck PARACRIL OZO

THE OIL-RESISTANT, OZONE-RESISTANT NITRILE RUBBER



Great new advance in wire jacket rubber

Now you can give your wire and cable jacketing new resistance to cuts and abrasion, superior resistance to attack by oils and solvents, outstanding new resistance to weather and ozone . . . *and enjoy all the benefits of color, too.*

Color code for fast, unerring identification . . . color for smart, modern appearance . . . to call attention . . . to hide . . . to add solid new sales appeal. Because PARACRIL® OZO takes and retains any color you desire, permanently.

In addition to color, PARACRIL OZO offers such advantages as:

- significantly superior ozone resistance
- excellent resistance to fuels, oils, and solvents
- exceptional abrasion resistance
- high physical properties
- good flame resistance

Try new PARACRIL OZO. See why it offers makers and users of not only wire and cable jackets, but of rubber products by the hundreds a host of valuable new selling possibilities. For more information, for samples, for technical assistance with a present or proposed application, contact your Naugatuck representative or the address below today.

Naugatuck Chemical

Division of United States Rubber Company Dept. A Elm Street Naugatuck, Connecticut

Rubber Chemicals · Synthetic Rubber · Plastics · Agricultural Chemicals · Reclaimed Rubber · Latices · CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Ltd., Elmira, Ontario · CABLE: Rubexport, N. Y.

A NEW SYMBOL

United Carbon Company
and its subsidiaries:

United Producing Company, Inc.

United Rubber & Chemical Company

and

United Carbon Company, Inc.

take pleasure in presenting this new trademark. It is our hope that United's products and services to the rubber, paint, plastics, ink, oil and gas industries will cause this new symbol to take a place among the respected trademarks of international industry.

United Carbon Company
and its subsidiaries
produce and market:

Carbon black, synthetic rubber black masterbatches, crude oil and natural gas.

NEW MATERIALS

Neotex 100, 130, and 150 Carbon Blacks

A series of carbon blacks in the range of HAF, ISAF, and SAF with reference to fineness, but with lowered carbon structure has been developed by Columbian Carbon Co., New York, N. Y. Based upon the development and production experience gained from Statex B, also a low structure black, these new blacks provide lower modulus and lower hardness with higher tensile than previous blacks of the same particle size.

Neotex 100 is an oil furnace carbon black in the HAF fineness range which produces compounded physical properties comparable to channel black. The cure rate, however, is similar to that of other furnace carbon blacks. This new carbon black may be used to develop tensile, modulus, and elongation properties equivalent to those of channel blacks in carcass stocks, off-the-road tire treads, and high-grade mechanical goods.

Neotex 130 is in the ISAF fineness range and may be used to develop good tensile, normal modulus, high elongation, and lower hardness which may be utilized in passenger treads to obtain improved ride and low noise while maintaining a good wear level. It also may be used to replace some ISAF or channel blacks in natural rubber truck and passenger tire stocks. The lower structure does make this grade of carbon black somewhat difficult to disperse in synthetic rubbers. Best dispersion is obtained by using the carbon black-rubber masterbatch approach.

Neotex 150 falls in the SAF fineness range. It produces the highest tensiles of all available rubber carbon blacks. It makes possible normal modulus, high elongations, and lower hardness compounds. These properties may be utilized to obtain the best combination of ride, low noise, and tread wear. This black does not lend itself to dry mixing processes owing to the low structure. It is suggested, however, as the tailor-made carbon blacks for use in the carbon black-rubber masterbatch processes.

Bostik 7070 Urethane Adhesive

A new versatile two-part adhesive said to have high resistance to oils and solvents and the ability to develop strong elastic bonds to leather, natural and synthetic fabrics, cork, wood, nylon, phenolics, and other plastics has been announced by B. B. Chemical Co., Cambridge, Mass.

The adhesive is especially recommended for uses where direct and prolonged contact with oil is encountered. The adhesive is claimed to have even greater oil resistance than neoprene and other synthetic rubber adhesives. Bostik 7070 is a room-temperature-curing adhesive based on a urethane rubber. Extensive use is expected for bonding urethane sponge and urethane rubber where resistance to washing and dry cleaning is required.

The adhesive is essentially colorless and has no residual odor. When cured, the bonds are tough and flexible, with excellent resistance to heat and cold, it is further claimed. The mixed working life of Bostik 7070 is about 18 hours, and it can be applied by brush, spatula, doctor knife, or roller coater.

Under normal room air temperatures, the assembly of parts can be accomplished from 25-60 minutes after adhesive application, reports the manufacturer. Time from application to assembly can be reduced to as little as five minutes, with heat to speed surface drying.

Additional information may be obtained from the B. B. Chemical Co.

(Continued on page 44)

how can rubber be best protected against SEVERE OZONE CONDITIONS?

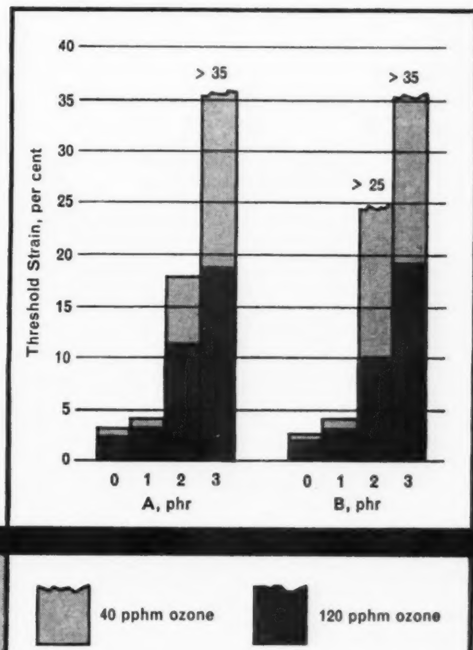


Chart above shows effects of increasing antiozonant content of SBR stocks to meet increasing ozone level.

severe conditions of ozone and stress call for extra-special protection . . .

Smog which may contain up to 100 pphm ozone is hard on health and disposition. It is equally hard on rubber products. High ozone levels cause severe cracking in rubber formulations. In addition, stress also contributes to this problem as shown in chart. How do you prevent such deterioration, assure long service life for your product under severest service conditions?

First, use antiozonants UOP 88 or 288, which offer maximum ozone protection. A relatively small loading of these low-cost antiozonants goes a long way in providing increased protection.

Ozone concentration is but one of many factors to consider in manufacturing antiozonant-containing rubber products. Our staff of specialists, backed by UOP laboratory facilities and field experience, will be happy to discuss your problems with you. Simply write or telephone our Products Department.

UOP®

UNIVERSAL OIL PRODUCTS COMPANY

30 Algonquin Road,
Des Plaines, Illinois, U.S.A.


ELASTOMAG
MAGNESIUM OXIDE

Photo

...cuts throw-away losses from hot, scorchy stocks!

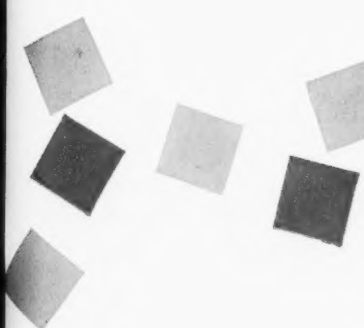
Morton's new activity-controlled oxides minimize scorch, improve bin stability ...give you higher-quality rubber

Pick the process safety you want . . . and get it *every* time with new Morton ELASTOMAG oxides! This new Morton development lets you use sensitive elastomer recipes without guesswork, or risk of loss! For the first time, you can predict process and curing aid performance with complete accuracy. This simplifies scheduling . . . boosts production . . . profits, too!

Three ELASTOMAG activity grades—high, medium, and low—make it easy to use sensitive recipes time after time without trouble. Each grade is held within extremely close limits on the Morton Activity Index scale for precisely predictable performance.

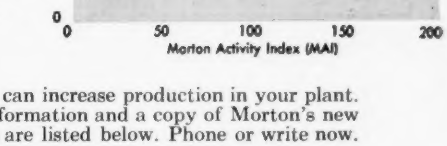
New Morton Activity Index (MAI) simplifies the use of magnesium oxide. It tells you the speed at which oxide will react . . . lets you choose an ELASTOMAG with the MAI value that provides best process safety, rate of cure, and state of cure. Morton researchers have proved that MAI—when used with oxides having superior dispersion—is a precision tool for predicting performance. Morton's new ELASTOMAG oxides are based on this research.

New ELASTOMAG Micro-Pellets—Dusting problems are minimized by Morton's new Micro-Pelletizing process. No binder or treating agent is used. In the mixer, Micro-Pellets break down to minute particles . . . provide the same superior dispersion as ELASTOMAG in the powdered form.



Predict process safety with new accuracy

Here's how Morton ELASTOMAG controls Mooney Scorch time. Notice how oxides with high Morton Activity Index (MAI) values give maximum safety. ELASTOMAG grades available have MAI ratings of 20, 100, and 170.



There's an ELASTOMAG oxide that can increase production in your plant. Ask your Morton Man for technical information and a copy of Morton's new ELASTOMAG bulletin. Distributors are listed below. Phone or write now.

Akron Chemical Company
255 Fountain Street
Akron, Ohio

Ernest Jacoby & Company
585 Boylston Street
Boston 16, Massachussetts

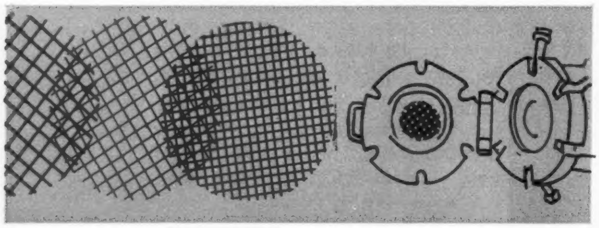
O'Connor & Company
4667 North Manor Avenue
Chicago 25, Illinois

H. M. Royal, Inc.
689 Pennington Avenue
Trenton, New Jersey

H. M. Royal, Inc.
11911 Woodruff Avenue
Downey, California

MORTON CHEMICAL COMPANY
110 N. Wacker Drive—Chicago 6, Illinois—Financial 6-6760

Photo courtesy of Chicago Rawhide Company



New Materials

(Continued from page 40)

New Hycar 1572 Latex

A new latex, designated Hycar 1572, which is a carboxy modified butadiene-acrylonitrile polymer of medium-high acrylonitrile content has been developed by the B. F. Goodrich Chemical Co., Cleveland, O. The latex is said to offer excellent mechanical stability, better heat aging properties than most nitrile latices, good fiber bonding qualities, and high abrasion resistance. The outstanding properties of this latex have led to the development of dipping compounds for canvas gloves and to methods of heat-sensitizing the latex for use as a non-woven fabric binder.

A Hycar Latex *Newsletter*, Issue No. 19, provides application data on this latex. It suggests ways of eliminating adhesion problems encountered in frictioning nitrile stocks to cotton and rayon fabrics. Recipes are presented for using Hycar latices in adhesives to provide wet strength in foil to kraft paper laminations.

Hycar nitrile and polyacrylic latices are said to improve dry and wet crock resistance and to provide excellent washfastness in textile prints. The bulletin presents a suggested formulation for a print paste together with a comparison of prints on cotton cloth.

New IMC Chloro-Aromatic Compounds

Four new, low-cost chloro-aromatic compounds with reactivity characteristics similar to those of benzyl chloride are being offered free in research quantities of one pound or more by International Minerals & Chemical Corp., Skokie, Ill.

The four compounds—monochloromethyl alkylbenzenes, bis (chloromethyl) alkylbenzenes, chloromethyl methylnaphthalenes, and polychloro methylnaphthalenes—are intermediates; they have a higher molecular weight, lower volatility, and lower cost than benzyl chloride, α,α'-dichloro-*p*-xylene, or α-chloro-*p*-xylene, according to the company. Many types of derivatives have been made readily in high yields, including esters, ethers, quaternary compounds, and amines.

IMC foresees applications of the new compounds in plasticizers, rubber, adhesives, mastics, caulking compounds, and other products. The bis (chloromethyl) product, a low-cost bifunctional compound, is potentially useful in all types of polymers. It can first be converted to glycol. The methylnaphthalene compounds are made with mixed methylnaphthalenes.

Requests for free samples should be directed to the research, engineering, and development division of the company.

Lajax Latex for Use with Concrete

Lajax, a specially stabilized 48% solids synthetic rubber for use in sand/cement mixes, is now available in quarts, gallons, five-gallon and 55-gallon drums from Ajax Floor Products Corp., Clifton, N. J. The use of various quanties of Lajax in concrete is said to result in improved adhesion, strength, shock and chemical resistance. Lajax, it is further claimed, completely eliminates the need of wet curing and undercutting to secure good bonds.

Lajax can be cut with water from 1:1 up to 1:7 by volume and used with prepared dry cement mixes and also with transit mixes, reports the manufacturer. Lajax/cement mixes should not be used at temperatures below 40° F., and the liquid must be kept from freezing. Such mixes set to completely age-resistant compositions suitable for interior and exterior floors and walls after a curing period of three days at normal temperatures. These mixes are recommended for use as concrete toppings, factory floors, brick mortar, swimming pool linings and repairs, setting flagstone and tile, and all general-purpose patching and underlayments.

More detailed information is available from the company.


ROEBLING
ROEBLING
START THIS
This lightweight "No Charge" spool is typical of Roebling's modern packaging methods that save customers time and money.
Are You Getting What You Pay For?
When you pay for HIGH QUALITY high-carbon wire, you want to be sure you get it. You do, when it is supplied by Roebling.
It is unsurpassed in quality, consistently true to specifications, and absolutely uniform in gauge. Hundreds of manufacturers attest to this fact... the qualities that they *pay* for – they *get* in Roebling high-carbon wire. The length of our relationship with customers proves it.
We'll be glad to show you what we mean. For information on superior high-carbon wire or cold rolled strip, write Roebling's, Wire and Cold Rolled Steel Products Division, Trenton 2, New Jersey.
ROEBLING
Branch Offices in Principal Cities
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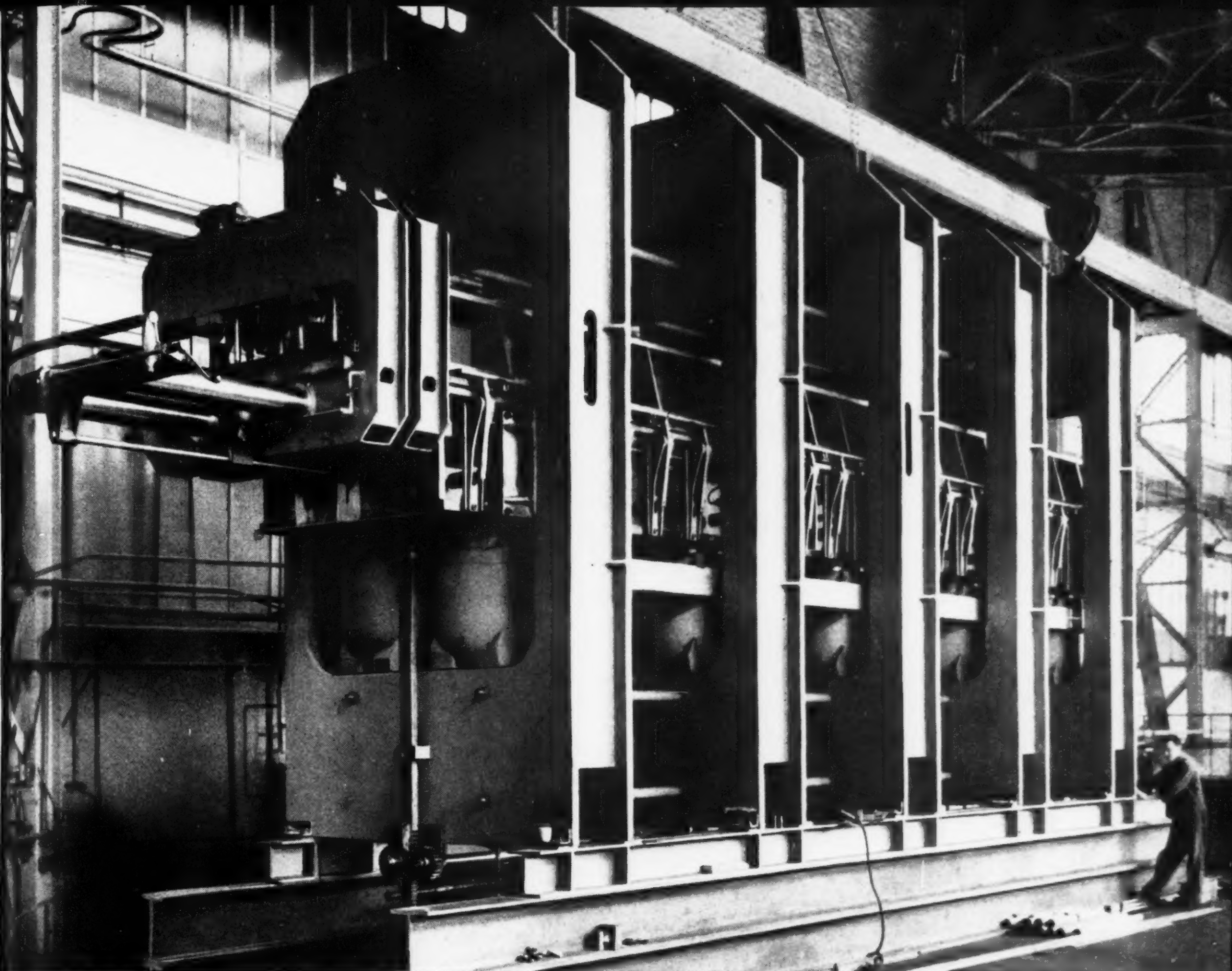
Roebling... Your Product is Better for it



TECHNICAL BOOKS

NEW PUBLICATIONS

"Carbon Black and Mineral Filler Loadings with Typical S-Polymers." SC-59-120. Shell Chemical Corp., synthetic rubber division, Torrance, Calif. 16 pages. This study is intended to aid the compounder in using a wide variety of Shell S-Polymers (SBR) to the best advantage. These data illustrate the balance of properties obtained with S-1000, S-1500, and S-1712 by varying each of four carbon blacks—ISAF, HAF, EPC, and SRF—over a range of loadings. For the mineral fillers, hydrated silica and hard clay were used in S-1502 compounds as these types of stocks are popular for light-colored and non-staining applications.

"Dow Corning Silicones." Dow Corning Corp., Midland, Mich. 1-115. 16 pages. This engineering guide is an up-to-date summary of the forms, properties and applications of Dow Corning silicones including such products as adhesives, release agents, laminating resins, rubber compounds, electrical insulation, and water repellants. The table of contents is arranged according to applications. Preaddressed business reply cards are provided. The guide is extensively illustrated with photographs, tables and graphs.

"Buy Log of Low-Voltage Equipment." GEC-1100B. General Electric Co., Plainville, Conn. 84 pages. Issued jointly by G-E's distribution assemblies and circuit protective devices departments, this 1960 edition of the Buy Log is designed to serve as a condensed buying catalog for products of the two departments, including service entrance equipment, light- and heavy-duty safety switches, tumbler and open-knife switches, hinged wireway, circuit breakers, switchboards, motor control centers, sectional distribution centers, and all types of panelboards and busways. This catalog is designed so that application, selection, pricing, and ordering information can be found quickly and easily.

"Borden Polymer Catalog." The Borden Chemical Co., New York, N. Y. 12 pages. Intended primarily for research and professional use, this revised catalog lists properties, end-uses, and other technical data such as % solids, viscosity, pH, particle size, % free monomer, specific gravity, and weight per gallon for more than 150 Borden polymers. Products covered include polyvinyl acetate homopolymer emulsions, copolymer solutions and bead resins; styrene-butadiene emulsions; acrylic emulsions and solutions; polystyrene emulsions; vinyl and vinylidene chloride emulsions; polyvinyl alcohol; sodium polyacrylate thickeners, and methyl acetate solvents; specialty monomers; and acrylic rubbers.

"Parco-Link Catalog." Pawling Rubber Corp., Pawling, N. Y. This new catalog covers the full line of custom-built entrance mats and stock matting of the company's Parco-Link line. It features illustrations for each product together with complete information covering price, sizes, colors, and other details. Products covered include all Parco-Link custom mats, Paragon vinyl plastic custom mats, and other lines of matting. Also included are details and specifications on the Parco universal mat recess frame and Neotex and Neosponge matting.

"Dill Catalog No. 14." Dill Mfg. Co., Cleveland, O. 24 pages. This dealer catalog describes Dill's complete line of tire valves, valve parts and accessories.

CHAMPION and NATKA 1200

Hard Carolina Clays

PAY PROCESSING DIVIDENDS

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- **REDUCTION OF MILL STICKING AND CALENDER PICK OFF.**
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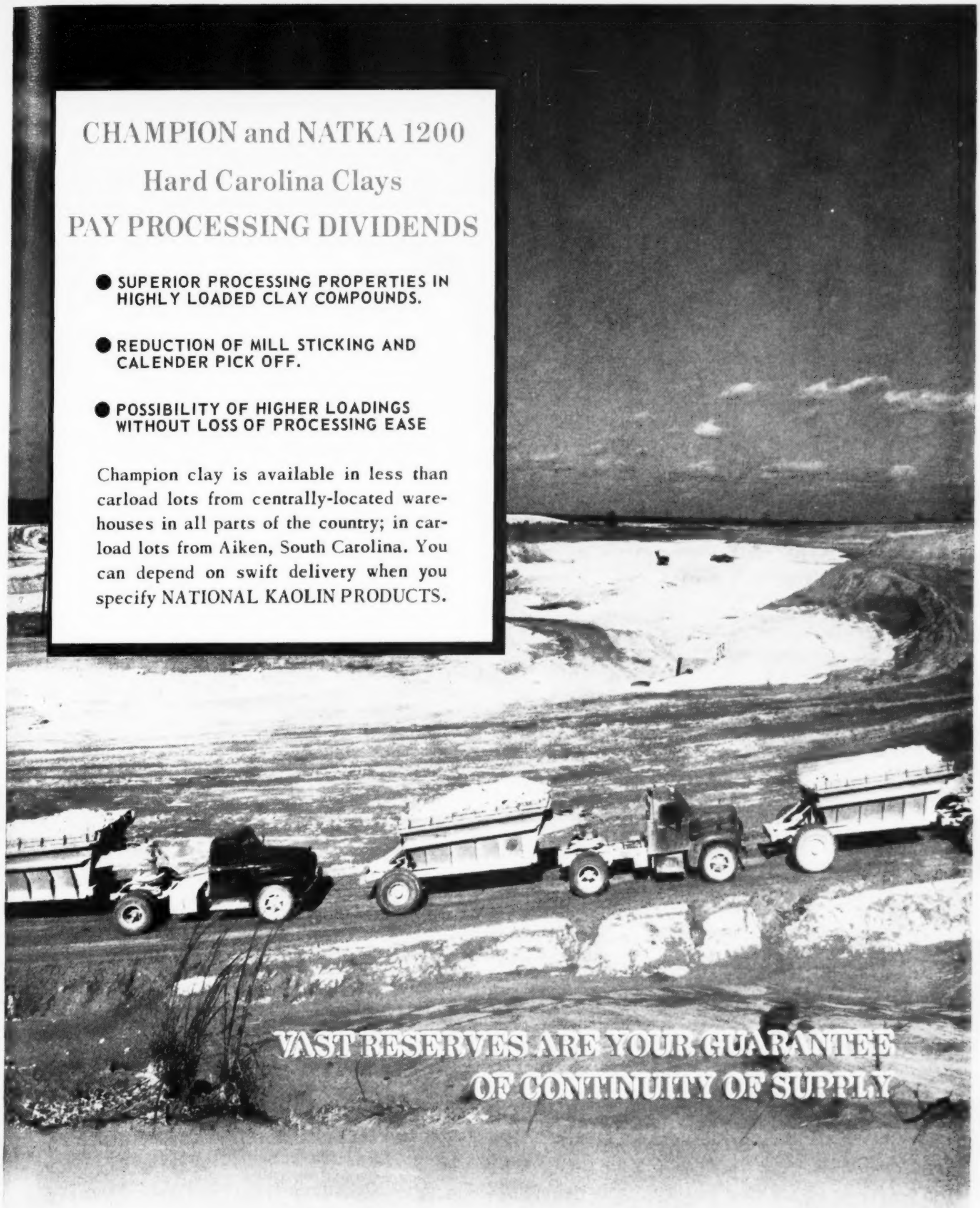

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Technical Books

"Goodrich-High Voltage Astronautics, Inc." Goodrich-High Voltage Astronautics, Inc., Burlington, Mass. 10 pages. This two-color brochure describes three major approaches to advanced propulsion and power conversion systems for space vehicles including the activities of the company as presently embracing the fields of ion propulsion, colloid propulsion, electrostatic power generation, and other electrical conversion techniques. Set up as a jointly owned subsidiary by The B. F. Goodrich Co. and High Voltage Engineering Corp., GHVA maintains headquarters at Burlington, Mass.

"Improved Compression Set Resistance for Polysulfide Type ST Rubber Compounds." Bulletin CS-1. Thiokol Chemical Corp., Trenton, N. J. 8 pages. This bulletin indicates that when oxides of calcium are used as activators in typical compounds of Type ST rubber, compression set resistance is significantly improved. Tables of data, summarizing laboratory study, compare the properties exhibited by calcium oxide-activated compounds for both the zinc peroxide and GMF cure systems.

"Grove Rubber Part Manufacturing Facility." Grove Valve & Regulator Co., Oakland, Calif. 4 pages. This brochure describes the company's rubber part manufacturing department which makes fittings for Grove valves and regulators. It describes and illustrates the entire operation, including specialized Grove machinery designed to make rubber parts to machine tool tolerances. Special machinery includes a 1,100-ton molding press, a transfer press which extrudes synthetic material under extreme pressures, and a variety of other presses, mills, and special apparatus.

"Pure Carbonic CO_2." Form ADPC 41. Pure Carbonic Co., New York, N. Y. 24 pages. This illustrated booklet covers the history, principal applications, properties, manufacture, supply and distribution of carbon dioxide (CO_2) in gaseous, liquid and solid ("dry ice") form. A major feature of the booklet is a section concerned with Pureco supply systems used to provide CO_2 according to the particular needs of the user. The flexibility and adaptability of these systems from a single cylinder of CO_2 to the large 100-ton capacity receivers are described.

"'Viton' O-Rings—Design and Media Data." Catalog No. 5711. Parker Seal Co., Cleveland, O. 24 pages. This handbook contains test information on some 150 fluids and gases to which "Viton" O-rings are compatible; recommended O-ring and groove design techniques; general information on three "Viton" O-ring compounds and dimensions; and data on all ARP (AN) standard O-ring sizes plus a considerable amount of general information on "Viton" O-rings.

"P-S Catalog—Materials Handling Equipment." Palmer-Shile Co., Detroit, Mich. 14 pages. This new catalog describes a wide variety of plant and warehouse handling equipment which has been standardized in dimension, capacity and price by the manufacturer. Items include stacking storage bins with a four-way lift-truck entrance, automatic dump boxes with gravity latch lock, and automatic side-dump trailer trucks. Many other grabs, slings, cradles, lifters, racks, etc. are described and illustrated.

Wiring System

(Continued from page 34)

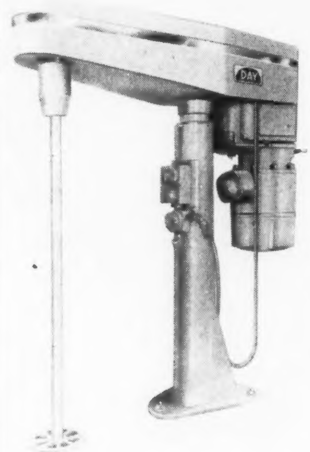
equipment on casters rolls over it easily.

Use of the system eliminates the cost of tearing up the floor for installation of permanent wiring. Straight standard lengths of this extension cord are available in 4-, 5-, 6-, and 10-foot lengths.

Literature giving more details is available from the manufacturer.

NEW EQUIPMENT

New "Daysolver" Dissolver



IDS-5 "Daysolver" Model 225 Dissolver

The J. H. Day Co., Cincinnati, O., recently introduced into its line of processing machinery a heavy-duty dissolver for mixing extra-viscous solutions. Designated the "Daysolver," this new mixer is already proving itself in industry, as well as in Day's customer service laboratory. This machine is built with a heavy-duty steel column, frame, and bridge, with oversize stainless-steel impeller shaft, to provide smooth, vibrationless operation under extreme work loads.

The bridge swings in a 240 degree arc, which makes it possible to mix one batch, with other drums of material positioned along the arc of the swing, ready for mixing, thus making for practically continuous operation. A special locking device is built internally in the column, for positive locking of the arm. A hoist, operated by 80 pounds of air pressure, cushioned at both ends of the stroke by an oil hydraulic circuit, provides rapid raising and lowering of the shaft and impeller.

A variety of impellers is available, including the newly designed Day "Turbopeller," which combines five mixing actions to provide exceptionally fast and thorough dispersion, particularly in heavier, more viscous solutions. Two-speed or variable-speed drives are supplied. The "Daysolver" is available in models for every mixing application, ranging from a laboratory-size model to a large 75-horsepower unit.

More detailed information is available from Day.

New D-S Caterpillar Capstan

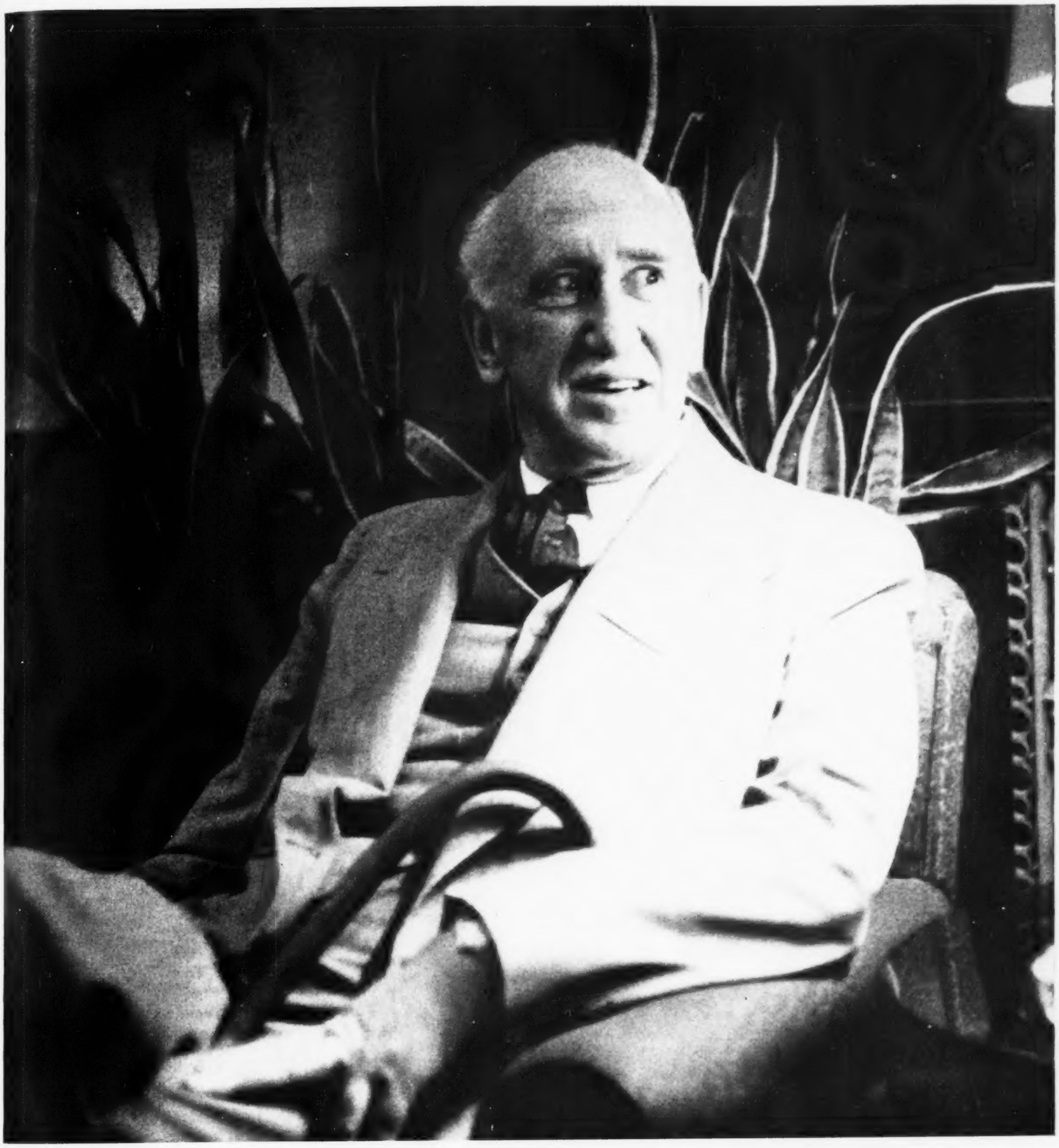
A general-purpose Caterpillar Capstan for large-diameter wire and cable insulating lines has been announced by Davis-Standard, division of Franklin Research Corp., Mystic, Conn.

The new capstan, Model MDC, is rated for 2,500 pounds' pulling capacity at speeds up to 250 feet per minute, reports the manufacturer. The special tread design provides a wrap-around grip on cables from 5/16-inch to five inch diameters.

Pneumatically controlled tread pressure up to 400 psi. is available on only 70-75 pounds of air, and extremely low air consumption is an outstanding feature of the capstan. Upper and lower treads open and close on a common centerline for precise horizontal alinement.

Shallow angle of treads at entrance end prevents damage of cable insulation. Horizontal and vertical guide rollers provide positive centering of cable in tread. A lead wire drum capstan is available as optional equipment for starting cable through the capstan treads.

Complete details on the Model MDC Caterpillar Capstan are outlined in Davis-Standard Catalog Section 7.6, available from the company.



In Memoriam

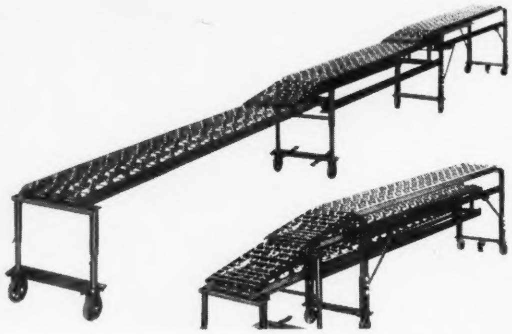
Mr. C. P. Hall

April 17, 1889 — April 17, 1960

Great truths are portions of the soul of man;
great souls are portions of eternity—*Lowell.*

The C. P. Hall Co.

New Equipment



Rapistan extendable conveyor

Rapistan Gravity Conveyor

The Rapistan extendable gravity conveyor that can be extended from less than 11 feet up to 30 feet in length has been introduced by The Rapids-Standard Co., Inc., Grand Rapids, Mich., manufacturer of Rapistan material handling equipment.

Mounted on five-inch-diameter casters to make it readily portable, the new unit is described as a nesting set of three 18-inch gravity wheel conveyor sections designed primarily for use in loading and unloading trucks, but it is also useful for moving materials into stacking areas and other warehousing applications.

When used for loading, the conveyor is extended as far as required into truck, car, or bay. As loading progresses, the conveyor is telescoped gradually until it is fully compressed, if necessary. Floor locks hold the unit rigidly in position while in use. For unloading, the procedure would be reversed, with the conveyor gradually extended as the workers move into the truck or bay.

The unit is also adjustable for height. The loading end can be raised from 34¼ inches to 41½ inches, with the unloading end adjustable from 20¼ inches to 27¼ inches. Each section has two-inch pitch built into the design. For runs longer than 30 feet, a section or more of standard gravity conveyor can be attached to either end.

Additional information on the unit is available from the company.

Mayer Type E Batch-Off Cooling Unit

A unit designed to provide uniform control and cooling of continuous batch-off rubber at increased production speeds with a saving of space, manpower, and material spoilage has been developed by Mayer Refrigerating Engineers, Inc., Lincoln Park, N. J.

Components comprising the unit include airlift stripper conveyor, stearate dip tank, riser conveyor, cooling conveyor, and a scorer pallet piler. All components are of standard construction, with flexibility to meet specific plant requirements.

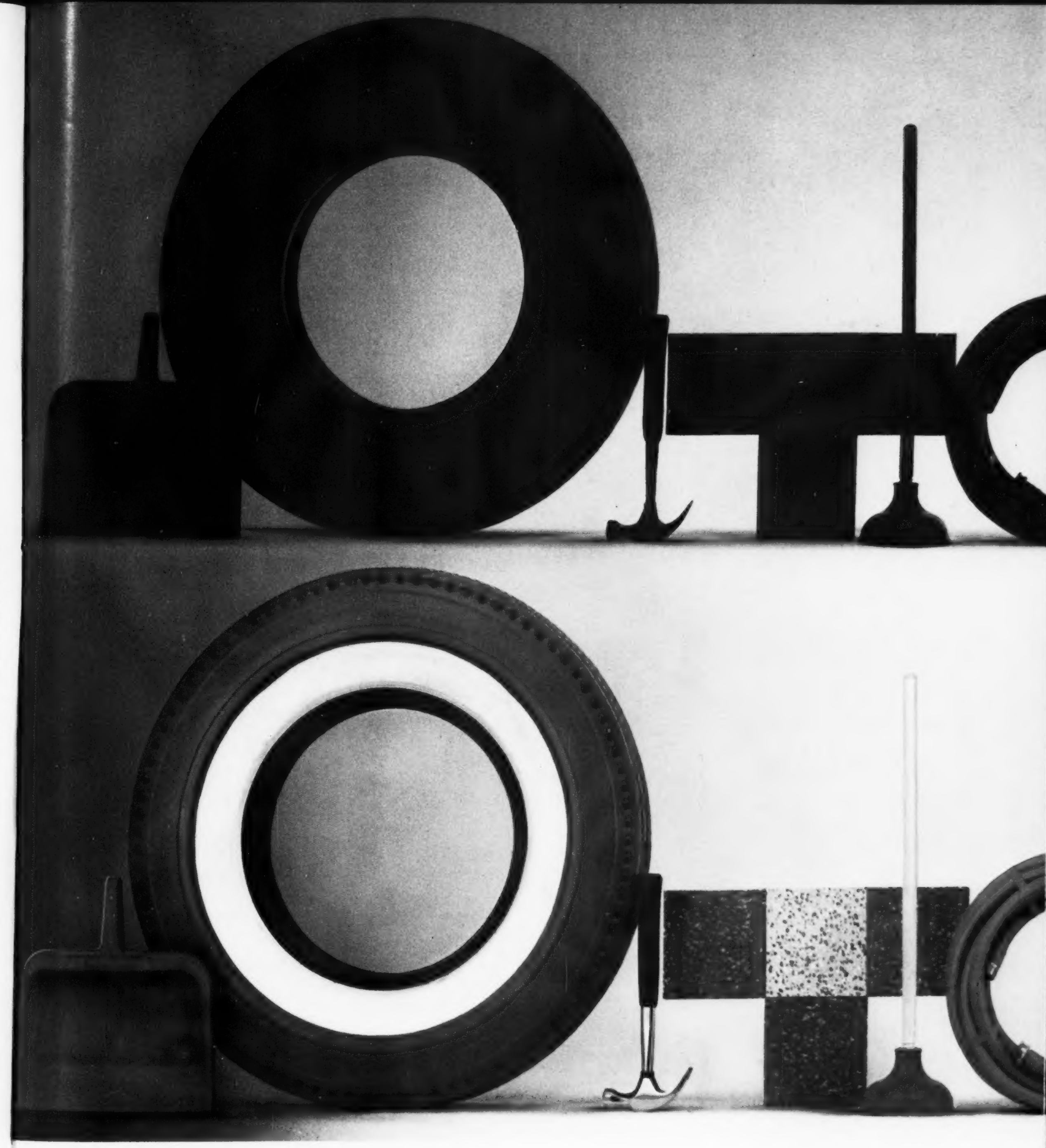
The airlift stripper conveyor cuts the rubber to desired width at mill speeds and conveys the strips into the dip tank. The dip tank containing the stearate is equipped with cooling coils, a recirculating pump for washing off excess stearate, and an automatic float valve for control of the liquid level. The tank is of ample size to accommodate the total batch.

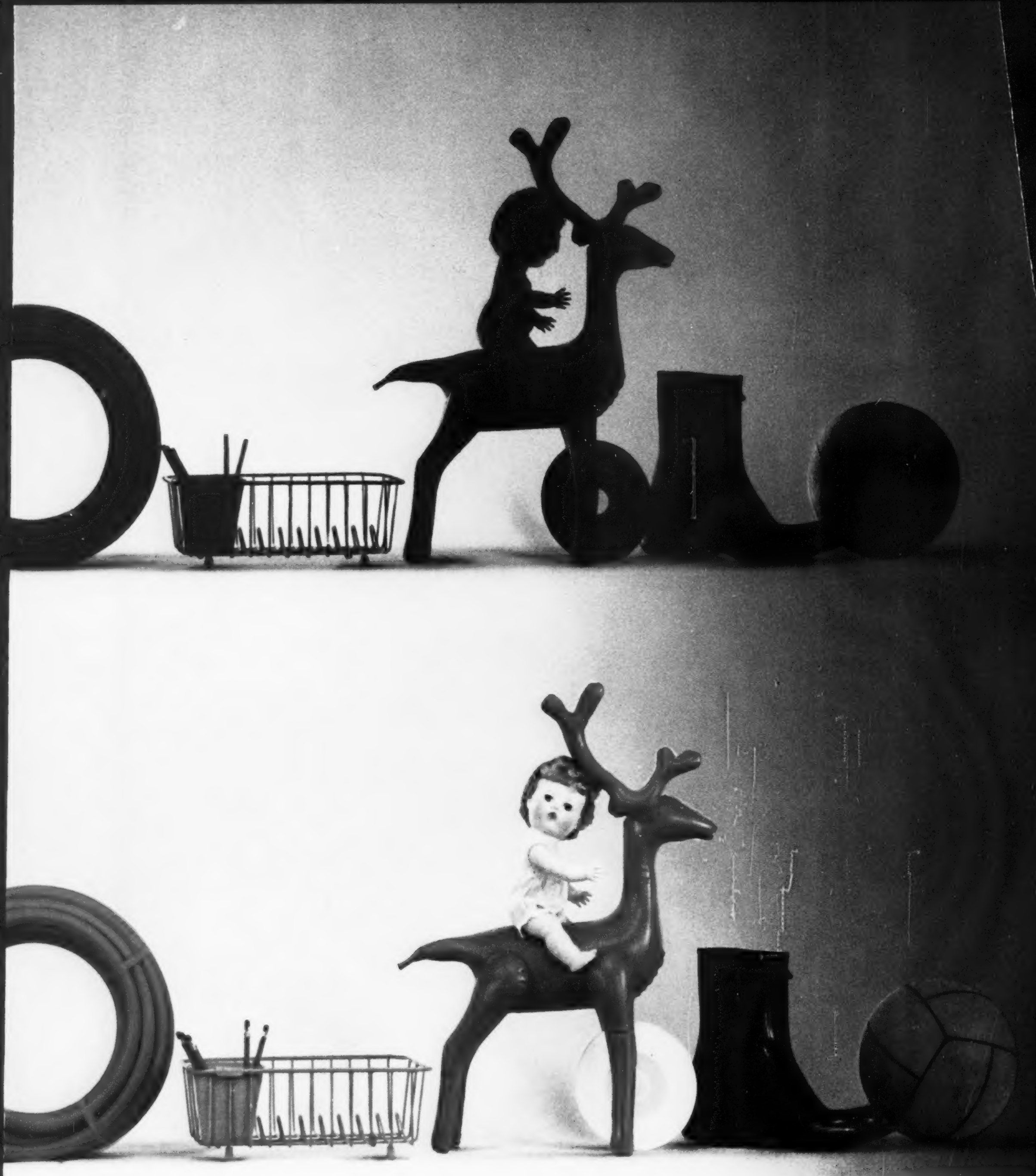
The riser conveyor transfers the rubber from the dip tank to the cooling unit. Variable speed drives are supplied.

The cooling conveyor is designed to cool the rubber to the desired internal temperature at a selective time period, ranging from 3 to 10 minutes. The Mayer patented Spra-Blast principle is employed, using refrigerated water supplied by a Mayer Chil-er recirculating unit or existing plant facilities.

A scorer pallet piler, at the discharge end of the cooling conveyor, deep scores the rubber at the desired length and automatically folds it on to the pallet.

Additional information is available from Mayer.





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Muriatic Acid • Calcium Hypochlorite • Titanium Tetrachloride

CALENDAR of COMING EVENTS

May 18-20

Fourth Annual Industrial Mutual Aid & Disaster Control Conference. Cincinnati, O.

May 20

New York Rubber Group. Dinner-Dance. Hotel Roosevelt, New York, N. Y.

Connecticut Rubber Group.

May 21

Air Power & Space Show. Wright-Patterson Air Force Base, Dayton, O.

May 23-26

Design Engineering Show. Coliseum, New York, N. Y.

May 27

Rubber Chemical Salesmen's Association of Akron. University Club of Akron, Akron, O.

June 1-2

Tlargi Foundation Technical Conference. Mayfair Hotel, Los Angeles, Calif.

June 3

Quebec Rubber & Plastics Group. Golf Tournament. St. Hyacinthe, P.Q., Canada.

June 4

Southern Ohio Rubber Group. Inland Activities Center, Dayton, O.

June 9

New York Rubber Group. Outing. Doerr's Grove, Millburn, N. J.

Rhode Island Rubber Club. Outing. Pawtucket Country Club, Pawtucket, R. I.

June 9-11

Manufacturing Chemists' Assn., Inc. Annual Meeting. The Greenbrier, White Sulphur Springs, W. Va.

June 10

Fort Wayne Rubber & Plastics Group. Golf Outing. Tippecanoe Lake Country Club, Leesburg, Ind.

June 10-11

Southern Rubber Group. Birmingham, Ala.

June 13-September 2

Gordon Research Conferences. Colby Junior College, New London, N. H.; New Hampton School, New Hampton, N. H.; Kimball Union Academy, Meriden, N. H.

June 17

Akron Rubber Group. Outing. Firestone Country Club.

Boston Rubber Group. Outing. Andover Country Club, Andover, Mass.

June 20-22

Molded, Extruded, Lathe Cut, and Sponge Rubber Products Subdivision, The Rubber Manufacturers Association, Inc. Annual Meeting. Skytop Lodge, Skytop, Pa.

June 24

Detroit Rubber & Plastics Group, Inc. Outing. Western Country Club.

June 26-July 1

American Society for Testing Materials. Annual Meeting and Subcommittee Meetings. Atlantic City, N. J.

August 2

New York Rubber Group. Golf Tourney. Forsgate Country Club, Jamesburg, N. J.

August 19

Philadelphia Rubber Group. Annual Outing. Manufacturer's Country Club, Oreland, Pa.

September 6-16

Production Engineering Show. Navy Pier, Chicago, Ill.

September 8-9

Chemical Institute of Canada and National Research Council. Tenth Canadian High Polymer Forum. Alpine Inn, Ste. Marguerite, P.Q., Canada.

September 10

Northern California Rubber Group. Outing.

Connecticut Rubber Group. Outing.

September 11-16

American Chemical Society. New York, N. Y.

September 13-16

Division of Rubber Chemistry, ACS. Hotel Commodore, New York.

September 29

Southern Ohio Rubber Group. Engineers Club, Dayton, O.

September 30

Rubber Chemical Salesmen's Association of Akron. University Club of Akron, Akron, O.

October 4

The Los Angeles Rubber Group, Inc.

October 7

The Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.

Detroit Rubber & Plastics Group, Inc. Detroit Leland Hotel, Detroit, Mich.

October 7-8

Southern Rubber Group. Roosevelt Hotel, New Orleans, La.

October 9-11

Rubber & Plastics Division and Erie Section, American Society of Mechanical Engineers. National Conference of Rubber and Plastics Engineers. Hotel Lawrence, Erie, Pa.

October 13

Northern California Rubber Group. Past Presidents' Night.

October 14

Boston Rubber Group. Hotel Somerset, Boston, Mass.

October 17-21

National Safety Council. Forty-Eighth Annual National Safety Congress. Chicago, Ill.

October 21

New York Rubber Group. Henry Hudson Hotel, New York, N. Y.

October 28

Rubber Chemical Salesmen's Association of Akron. University Club of Akron, Akron, O.

November 3

Rhode Island Rubber Club. Pawtucket Country Club, Pawtucket, R. I.

November 4

The Philadelphia Rubber Group. Fall Dance. Manufacturer's Country Club, Oreland, Pa.

November 10

Northern California Rubber Group.

November 18

Connecticut Rubber Group.

November 25

Rubber Chemical Salesmen's Association of Akron. University Club of Akron, Akron, O.

November 30-December 1-2

U. S. Army Signal Research & Development Laboratory. Ninth Annual Symposium on "Technical Progress in Communication Wires and Cables." Berkeley-Carteret Hotel, Asbury Park, N. J.

December 3

Northern California Rubber Group. Christmas Party.

December 9

Detroit Rubber & Plastics Group, Inc. Christmas Meeting. Statler-Hilton Hotel, Detroit, Mich.

December 10

Southern Ohio Rubber Group. Christmas Party. Miami Valley Golf Club, Dayton, O.

December 16

New York Rubber Group. Christmas Party. Henry Hudson Hotel, New York, N. Y.

Boston Rubber Group. Christmas Party. Somerset Hotel, Boston, Mass.

1961

February 7

The Los Angeles Rubber Group, Inc.

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Quality Control Techniques Could Help More Companies

WE HAVE been convinced for some time that greater use of mathematical statistical methods is essential for improving the operations of research and development laboratories as well as producing plants in the rubber and related industries. In the former case mathematical statistics aid in the design of experiments so that more information per experiment is obtained for the same amount of effort. In the latter, mathematical statistics in the form of quality control methods improve the quality of the product delivered and lower manufacturing costs. Who can afford to overlook any of these factors in today's extremely competitive industrial world?

In keeping with our conviction as to the value of mathematical statistics in industry, we have welcomed and encouraged the use of these techniques wherever possible in connection with articles submitted for publication. We anticipate that a growing number of articles will report results based on "designed" experiments.

In an attempt to encourage the increased use of statistical quality control methods in production, we presented in 1959 a series of articles on these methods by Prof. Mason E. Wescott of Rutgers University. Although there were some requests for reprints of these articles, the initial response was by no means overwhelming.

Recently the Prentice-Hall Management Letter mentioned these RUBBER WORLD articles on "Fundamental Control Techniques," and in two weeks 30 companies asked for reprints, and the requests are still coming in. The interesting thing about these requests is that two-thirds of them were from companies in the medium to small-size category, and they included companies manufacturing consumer goods, machinery, metal products, rubber and plastics products, instruments, lumber, and concrete. Only three requests were received from large companies with several thousand employes and a $50-$100 million annual sales volume.

The Molded, Extruded, Lathe-Cut and Sponge Rubber Products Subdivision of The Rubber Manufacturers Association, Inc., recently has been devoting considerable attention to quality control and acceptance sampling at its most recent meetings. This RMA Subdivision includes many medium-size companies among its members.

Although the use of mathematical statistics and quality control methods has grown significantly in industry during the past 20 years, this growth has been, in general, concentrated in the large integrated companies. Apparently many of the smaller companies felt that the costs were too great for their type of operations. Interest in quality control methods among smaller companies, however, appears now to be much more active.

We suggest that more companies in the rubber and related fields investigate thoroughly the use of these techniques. We believe they will be surprised to find how little it costs to save considerable amounts of money by the use of quality control methods.

R. G. Seaman

EDITOR

RUBBER WORLD

Properties of High-*trans* Polybutadiene[1]

Basic properties and typical application trials indicate possible commercial uses of this balata-like material

By H. E. RAILSBACK, J. R. HAWS, and C. R. WILDER
Phillips Petroleum Co., Bartlesville, Okla.

ELASTOMERS of great significance to the rubber technologist have been obtained by the polymerization of butadiene or isoprene with catalyst systems which yield polymers of controlled structure (*cis*, *trans*, and vinyl configuration). The processing and properties of high-*cis* polybutadiene (1-6)[2] (exemplified by Cis-4[3] polybutadiene) and *cis*-polyisoprene (7, 8) have been described in the literature in detail. Although the literature contains considerable information about the properties of naturally occurring *trans*-polyisoprene (9), very little information can be found which describes the polymerization, compounding, and properties of *trans*-polybutadiene. Actually, the limited information in the literature deals more with the polymerization aspects of *trans*-polybutadiene than with the compounding and properties (1, 5, 10, 11, 12).

High *trans* configuration in polybutadiene results in a polymer which is hard and crystalline at room temperature, thermoplastic and vulcanizable. Polybutadienes of this type thus display properties similar to those usually associated with plastics and under other conditions behave like rubbers. In fact, polybutadienes having a *trans* content of approximately 90% resemble balata and gutta percha, the naturally occurring *trans*-polyisoprenes, in certain physical properties.

It is the purpose of this report to describe compounding techniques and to characterize the properties of high-*trans* polybutadiene rubbers. Thus the rubber technologist will be able to classify polymers of this type for potential service applications. The very unique properties of *trans*-polybutadiene rubbers should be of particular interest to the makers of industrial rubber products and mechanical rubber goods.

TABLE 1. POLYMER DESCRIPTION

Configuration	*trans*-Polybutadiene				Balata
trans, %	93	87	81	88	—
cis, %	5	10	16	10	—
Vinyl, %	2	3	3	2	—
Gel, %	0	0	0	0	Trace
Specific gravity	0.963	0.953	0.927	0.950	0.944
Inherent viscosity	1.73	1.62	1.84	2.16	1.51
Mooney viscosity					
ML-4 at 212° F.	96	25	26	131	21
250° F.	21	20	23	44	16
280° F.	18	19	19	38	10
Softening point range,* temperature, °F.	210-220	190-200	160-170	195-205	125-135

* Goodrich plastometer—Arbitrary temperature range in which the rubber distorts under a load of 10 psi.
N.B. See Appendix for details of Test Methods.

Raw Polymers

Pilot-plant quantities of *trans*-polybutadienes prepared

[1] Presented before the Southwest Regional Meeting of the American Chemical Society, Baton Rouge, La., Dec. 3-7, 1959.
[2] Numbers in parentheses refer to Bibliography at end of article.
[3] Phillips Chemical Co., Akron 8, O.

TABLE 2. PROPERTIES OF COMPRESSION MOLDED UNVULCANIZED *trans*-POLYBUTADIENE

	trans-Polybutadiene				Balata
trans, %	93	87	81	88	—
Mooney viscosity, ML-4					
at 212° F.	96	25	26	131	21
250° F.	21	20	23	44	10
Tensile,* psi.	1230	1050	365	1330	4790
Elongation, %	40	20	55	75	500
Resilience, %					
Lupke	74	75	78	76	74
Yerzley	80	80	65	80	84
Shore A Hardness					
80° F.	98	95	87	97	94
130° F.	85	91	59	93	75
180° F.	66	73	38	77	9
212° F.	63	58	13	70	—
250° F.	23	15	3	19	—

* Pulled at 20 ins./min.
N.B. See Appendix for details of Test Methods.

TABLE 3. EFFECT OF VARIOUS CHEMICALS ON RAW RUBBER IMMERSED THREE DAYS AT 80° F.

	trans-Polybutadiene	Balata
Ammonium hydroxide ($30\%\ NH_3$)	No effect	No effect
Sulfuric acid (98%)	Charred, but no swelling	Charred
Hydrochloric acid (38%)	Polymer darkened slightly	No effect
Nitric acid (70%)	Polymer digested	Polymer digested
Glacial acetic acid	No effect	No effect
Acetone	No effect	No effect
Methanol	No effect; darkened solvent slightly	No effect
Benzene	Dissolved; gel left	Dissolved; gel left
Toluene	Swelled	Swelled; partially dissolved
n-Heptane	No effect	No effect
Carbon tetrachloride	Dissolved	Dissolved

TABLE 4. BASIC RECIPES—VULCANIZED GUM STOCKS

	trans-Polybutadiene	Natural Rubber, NR (#1 RSS)	SBR 1500
Polymer	100	100	100
Zinc oxide	3	4	3
Stearic acid	2	3	1
Flexamine*	1	1	1
Sulfur	1.75	2	1.75
NOBS Special†	1.6	0.7	–
Santocure‡	–	–	1.5

* Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.
† American Cyanamid Co., rubber chemicals department, Bound Brook, N. J.
‡ Monsanto Chemical Co., rubber chemicals department, Akron 11, O.

TABLE 5. PHYSICAL PROPERTIES OF VULCANIZED GUM COMPOUNDS

	trans-Polybutadiene				NR	SBR 1500
trans, %	93	87	81	88	—	—
Mooney viscosity,						
ML-4 at 212° F.	96	25	26	131	90	53
250° F.	21	20	23	44	—	—
(30 Minutes' Cure at 307° F.)						
Compression set,* %	96	20	26	27	13	19
Tensile, psi.	810	580	330	760	3330	200
Elongation, %	860	350	530	560	760	330
200° F. tensile, psi.	70	180	160	200	960	200
300° F. tensile, psi.	150	180	30	100	160	0
Heat build-up, °F.	†30	29	19	30	7	27
Resilience, %	73	70	81	76	92	79
Shore A hardness,						
80° F.	94	88	66	82	42	42
212° F.	48	49	48	52	39	42
300° F.	49	50	52	53	41	45
NBS abrasion,						
rev./mil.	29.00	6.95	4.94	8.92	3.08	<1
Lupke rebound, %	77	70	86	73	90	83

* Determined at 212° F. See Appendix on Test Materials, No. 1.
† 45-minute cure.

in Phillips Petroleum Co. research facilities have been designated Philprene X-10 when the *trans* configuration is in the range of 90%.

Four samples of *trans*-polybutadiene differing in *trans* content and molecular weight are described in Table 1.

Properties determined on unvulcanized, compression molded samples show the high resilience and hardness of *trans*-polybutadiene polymers (see Table 2). Both hardness and tensile strength increase with *trans* content. Tensile strength is also higher for the higher Mooney polymer.

Although these high-*trans* polybutadienes are inferior to balata in tensile strength, resilience and hardness values are similar to those of balata at room temperature. All of the *trans*-polybutadienes have a slightly higher softening point than that displayed by natural *trans*-polyisoprene.

Comparison of the effect of typical acids, bases, and solvents on raw *trans*-polybutadiene rubber and balata is shown in Table 3.

Raw Philprene X-10 polymers are stiff and boardy; milling is possible only at elevated temperatures (180 to 280° F.). The higher temperature is required to mill the polymers with the highest *trans* content. At equal *trans* content, processing becomes progressively harder with increasing of the polymer Mooney viscosity. On a hot mill the polymers soften, taking on a molten plastic appearance; however, when removed from the mill and cooled, the polymers return to their original hard and rigid condition.

Vulcanized Gum Stocks

The *trans*-polybutadiene rubbers examined as raw polymers were also studied in vulcanized gum stocks

Griggs Studio

H. E. Railsback

Herman's Studio

J. R. Haws

Herman's Studio

C. R. Wilder

The Authors

H. E. Railsback, manager, rubber compounding laboratory, research division of Phillips Petroleum Co., is a graduate of Peru State College in Nebraska (1936) and did graduate work and teaching at the University of Nebraska and at Peru State College until 1941. He then joined E. I. du Pont de Nemours & Co., Inc., where he worked until he entered the research division of Phillips Petroleum in 1945. He has been manager of the rubber laboratory since 1955. This author is a member of the American Chemical Society and its Division of Rubber Chemistry.

J. R. Haws, a group leader in the rubber compounding laboratory, Phillips research, received his B.S. in Chemical Engineering from Oklahoma State University in 1950 and was employed in the University's Research Foundation for a year before joining the Phillips research division. He also is a member of the ACS and its Rubber Division.

C. R. Wilder, research chemist, rubber compounding laboratory, received his B.S. in Chemistry from West Texas State College in 1951 and an M.A. degree from the University of Texas in 1952. He has been employed by Phillips research since 1952 except for two years' service with the U. S. Army Chemical Corps Maryland Research Center. He is a member of the ACS.

(see Table 4 for basic recipe).

In vulcanized gum stocks (see Table 5 for physical properties) the *trans*-polybutadiene rubbers displayed higher 80° F. tensile strength[4] than SBR 1500, but were inferior to natural rubber in this property. At 300° F. the tensile strength of the *trans*-polybutadiene compounds is near to that of natural rubber. The *trans*-polybutadiene gum stocks reach maximum modulus at elongations less than 100% and modulus remains at this level as the tensile specimen necks down and ultimately breaks at high elongation. Thus 100%, 200%, and 300% moduli are the same for a specific stock. This phenomenon is similar to the modulus trend displayed by certain plastics.

These *trans*-polybutadiene gum stocks were at similar states of cure with the exception of the 93% *trans* polymer which had a lower degree of cure as judged by compression set and elongation. The polymer with lower *trans* content gave the best resilience. Abrasion resistance, as determined by the National Bureau of Standards procedure in ASTM D 394-47, was much better for *trans*-polybutadiene than for natural rubber or SBR 1500.

The Shore hardness of *trans*-polybutadiene decreased

[4] See Appendix, Test Method No. 4.

TABLE 6. BASIC FORMULATIONS—VULCANIZED BLACK-REINFORCED STOCKS

	trans-Polybutadiene	SBR 1500	NR
Polymer	100	100	100
HAF black (Philblack O)*	50	50	50
Zinc oxide	3	3	3
Stearic acid	2	1	3
Flexamine	1	1	1
Resin 731	5	–	–
Philrich 5* oil	–	10	–
Pine tar	–	–	3
Sulfur	1.75	1.75	2
NOBS Special	1.25	–	0.5
Santocure	–	1.2	–

* Phillips Chemical Co., Akron 8.

appreciably when the test temperature was raised from 80 to 212° F.; however, no further softening was noted on raising the temperature to 300° F., which indicates the crystalline nature is retained, to some degree, after vulcanization. Reference to the Shore hardness values obtained on molded, unvulcanized specimens shows, however, that the thermoplastic nature of *trans*-polybutadiene is greatly altered on vulcanization.

TABLE 7. PROCESSING DATA OF BLACK-REINFORCED STOCKS

	trans-Polybutadiene				SBR 1500	NR
trans, %	93	87	81	88	—	—
Mooney viscosity,						
ML-4 at 212° F.	96	25	26	131	53	90
250° F.	21	20	23	44	—	—
Compounded Mooney viscosity, MS-1½						
at 212° F.	Too high	65	41	Too high	33	48
250° F.	37	31	33	130	26	39
280° F.	25	27	30	60	22	35
Mooney Scorch at 280° F., minutes						
to 5-point rise	19.0	9.5	15.5	13.5	22.5	11.5
Extrusions at 250° F.,						
Inches/minute	35	36	40	23	43	53
Grams/minute	108	90	93	73	114	116
Rating*	12	12	12−	10+	11+	12−

* Relative rating, Garvey die, 12—perfect; 3—poorest.

Black-Reinforced Stocks

Processing

The *trans*-polybutadienes evaluated as molded specimens or in gum stocks were also evaluated in vulcanized black-reinforced compounds. Basic formulations are shown in Table 6.

In these compounds, as in the gum stocks, elevated temperatures were necessary in order to mill the *trans*-polybutadienes. As expected, the low Mooney viscosity polymers process easier than those of higher Mooney viscosity. All the *trans*-polybutadiene stocks reverted to a stiff boardy condition when allowed to cool after milling.

The polymers of highest *trans* content displayed a greater decrease in compounded Mooney with an increase in temperature than the other stocks examined. The *trans*-polybutadiene stocks milled easily and displayed very good extrusion appearance. The processing data are summarized in Table 7.

Properties

As judged by the scorch time or cross-linking,[5] there were some differences in rate of cure for the *trans*-polybutadiene compounds (see Tables 7 and 8). These differences in cure, however, appeared to have little correlation with Mooney viscosity or *trans* content.

Several of the high-*trans* polybutadiene compounds

[5] The term "cross-linking" is used for brevity throughout this report to describe the density of effective network chains. See Appendix on details of Test Methods.

TABLE 8. PHYSICAL PROPERTIES OF BLACK-REINFORCED STOCKS

	trans-Polybutadiene				SBR 1500	NR
trans, %	93	87	81	88	—	—
Mooney viscosity, ML-4 at 212° F.	96	25	26	131	53	90
250° F.	21	20	23	44	—	—
(30 Minutes' Cure at 307° F.)						
Compression set,* %	9	0	16	7	18	14
Cross-linking X 10^4, moles/cc.	1.35	1.45	1.28	1.58	1.40	1.70
300% modulus, psi.	1850	1820	1230	2530	1520	2020
Tensile, psi.	3190	3530	2750	3680	3490	4200
Elongation, %	690	590	595	445	530	495
200° F. tensile, psi.	1900	2080	1600	1990	1840	3080
300° F. tensile, psi.	900	1250	930	1100	860	1250
Tears, lbs./in.	700	530	485	500	310	775
Heat build-up, °F.	98	74	86	78	62	41
Resilience, %	61	57	61	59	61	71
Flex life, M flexures	6	4	7	1	12	250
Lupke rebound, %	66	61	71	59	70	74
Shore A hardness, 80° F.	97	88	85	89	58.5	64
212° F.	58	60	56.5	63	55.5	59
300° F.	59	60	57.5	64	56	59
NBS abrasions, rev./mil.	197	200	576	774	11	12
(Oven Aged 24 Hours at 212° F.)						
Tensile, psi.	—	3700	3300	4280	3300	3410
Elongation, %	—	410	400	320	410	410
Heat build-up, °F.	—	55	54	51	51	37

* Method No. 1 of Test Methods in Appendix.

displayed low compression set at 212° F. In fact, the stock prepared using 87% *trans*-polybutadiene had zero compression set, for the 30- and 45-minute cures, in the compounding recipe used.

Tensile properties of the *trans*-polybutadiene black-reinforced vulcanized compounds were quite good, in most instances, showing both high modulus and tensile strength. The compounds with the highest *trans* configuration displayed evidence of necking down when elongated. This necking down is similar to that observed with certain plastics.

NBS abrasion resistance was extremely good for the *trans*-polybutadiene rubbers. The black-reinforced compounds show from 20 to 70 times better resistance to wear than SBR 1500 or natural rubber control compounds, by this test. Changes in hardness with increasing temperature were similar to those observed for the gum stocks.

Hysteresis properties of high *trans* content polybutadienes were, in general, poorer than those of SBR 1500. The lower *trans* content polybutadienes gave hysteresis properties similar to SBR 1500 especially after 24 hours at 212° F. in a forced draft air oven. Tensile strength and modulus increased; while elongation and heat build-up decreased under these aging conditions.

[6] Hercules Powder Co., Wilmington 99, Del.

Effect of Plasticizers

The effect of various levels of stearic acid, Resin 731,[6] oils (highly aromatic, naphthenic, paraffinic), and pine tar was evaluated in black-reinforced stocks. The basic recipes employed are shown in Table 9.

Using the levels shown in Table 10, the addition of the various softeners had no significant effect on milling characteristics except that at the highest softener levels the stocks became quite soft. Although there were some differences in extrusion rate, the appearance of the samples was excellent in almost all cases. Actually, the poorest stock in extrusion appearance was relatively good. Since the effect of the petroleum base oils was

TABLE 9. EFFECT OF PLASTICIZERS

Basic Recipes

trans-Polybutadiene	100	100	100
HAF black (Philblack O)	50	62.5	75
Zinc oxide	3	3	3
Stearic acid	variable	2	2
Plasticizer	variable	25	50
Flexamine	1	1	1
Sulfur	1.75	1.75	1.75
NOBS Special	1.25 or 1.35	1.35	1.35

TABLE 10. EFFECT OF PLASTICIZERS—PROCESSING DATA

trans-Polybutadiene	25 ML-4, 87% *trans*					20 ML-4, 84% *trans*			
Stearic acid, phr.	2	2	2	2	2	2	5	2	2
Plasticizer, phr.	0	5	10	10	10	—	—	25	50
Type	—	Resin 731	Resin 731	Philrich 5	Pine tar	—	—	Philrich 5	Philrich 5
Mooney viscosity, MS-1½ @ 212° F.	35	29	25	23	24	35	35	22	15
Extrusions @ 250° F.,									
Inches/minute	31	40	44	38	52	49	46	54	62
Grams/minute	83	101	107	96	126	98	94	96	107
Rating	12	12	12	12	12	12	12	11+	10+

TABLE 11. EFFECT OF PLASTICIZERS—PHYSICAL PROPERTIES

trans-Polybutadiene	25 ML-4, 87% *trans*					20 ML-4, 84% *trans*			
Black, phr.	50	50	50	50	50	50	50	62.5	75
Stearic acid, phr.	2	2	2	2	2	2	5	2	2
Plasticizer, phr.	—	5	10	10	10	—	—	25	50
Type	—	Resin 731	Resin 731	Philrich 5	Pine tar	—	—	Philrich 5	Philrich 5
(30 Minutes' Cure at 307° F.)									
Cross-linking X 10^4, moles/cc.	1.56	1.51	1.33	1.43	0.99	1.72	1.76	1.41	1.02
Compression set,* %	0	0	2	10	16	10	10	25	44
300% modulus, psi.	2050	1860	1560	1390	1140	2010	2190	1290	710
Tensile, psi.	3610	3490	3380	3000	2190	3300	3360	2210	1280
Elongation, %	520	545	620	600	710	450	430	470	530
Heat build-up, °F.	75	71	71	68	129	68	62	73	152
Resilience, %	65	59	52	61	60	64	63	62	58
Shore A hardness, 80° F.	98	97	97	98	97	94	94	83	78
212° F.	62	62	58	56	54	—	—	—	—

* Method No. 1 of Test Methods in Appendix.

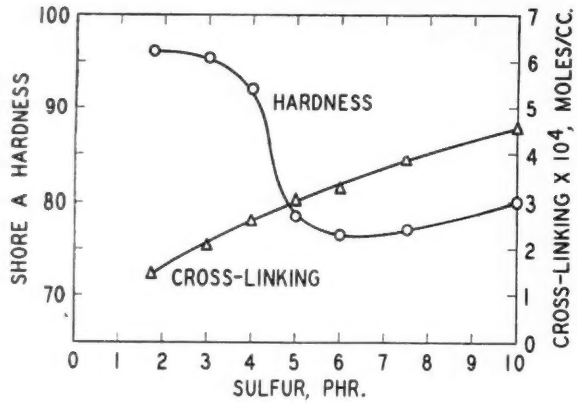

Fig. 1. Effect of sulfur level on hardness and cross-linking on high-*trans* polybutadiene

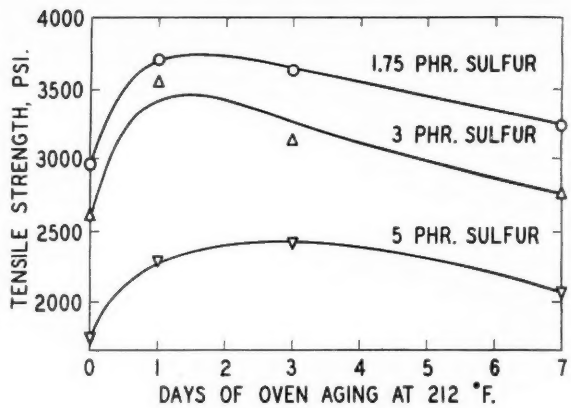

Fig. 3. Effect of sulfur level and heat aging on tensile strength on high-*trans* polybutadiene

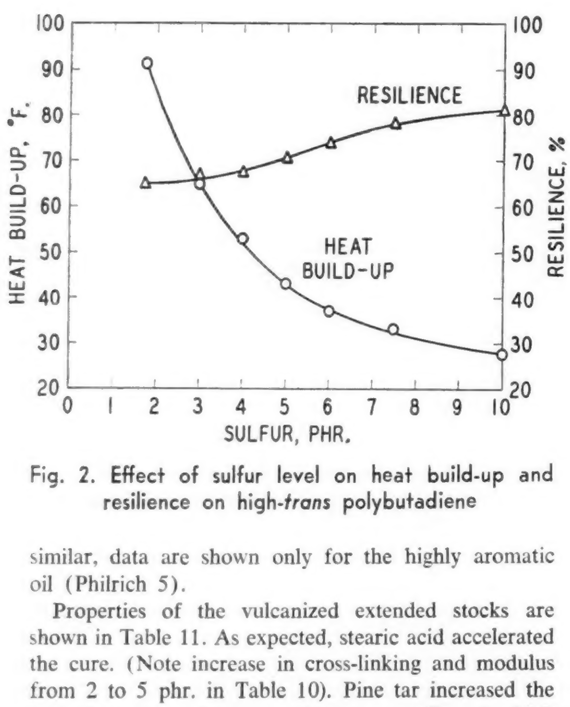

Fig. 2. Effect of sulfur level on heat build-up and resilience on high-*trans* polybutadiene

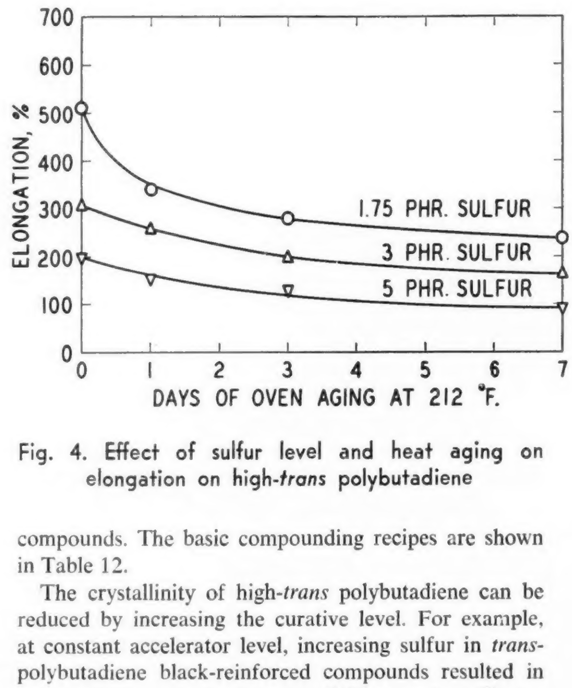

Fig. 4. Effect of sulfur level and heat aging on elongation on high-*trans* polybutadiene

similar, data are shown only for the highly aromatic oil (Philrich 5).

Properties of the vulcanized extended stocks are shown in Table 11. As expected, stearic acid accelerated the cure. (Note increase in cross-linking and modulus from 2 to 5 phr. in Table 10). Pine tar increased the rate of extrusion; however, pine tar as well as the high levels of petroleum-base oils had a deleterious effect on the physical properties of the cured vulcanizates.

It should be kept in mind that 25 to 50 phr. softener is a high extender level in a 20-Mooney viscosity polymer. Better physical properties would probably be obtained with a higher Mooney rubber. The thermoplastic nature of Philprene X-10 presents a means of maintaining a constant plasticity level in the compound with the addition of plasticizer during processing. Thus it is possible to use higher oil levels in Philprene X-10 than is usually feasible with a similar Mooney viscosity SBR.

Effect of Curing Systems

Variable sulfur and Di-Cup (dicumyl peroxide) levels were evaluated in *trans*-polybutadiene black-reinforced compounds. The basic compounding recipes are shown in Table 12.

The crystallinity of high-*trans* polybutadiene can be reduced by increasing the curative level. For example, at constant accelerator level, increasing sulfur in *trans*-polybutadiene black-reinforced compounds resulted in the expected increase in cross-linking and resilience; while elongation and heat build-up decreased. A sulfur level of approximately 5 phr. was necessary before an appreciable reduction in Shore hardness was obtained; however, as the sulfur was increased beyond 6 phr., Shore hardness again increased slightly. (See Figures 1 and 2). The effect of oven aging on tensile and elongation is shown in Figures 3 and 4, respectively.

Similar trends were observed with an increase in Di-Cup level. A comparison of the two curing systems in an 84% *trans* polymer is shown in Table 13. With formulations that give similar states of cure at identical cure times, the Di-Cup stocks give shorter time to scorch. On cured stocks, at similar cross-linking, the Di-Cup cures give lower compression set, elongation, and heat build-up; while modulus and Shore hardness are higher than were obtained with sulfur cured compounds.

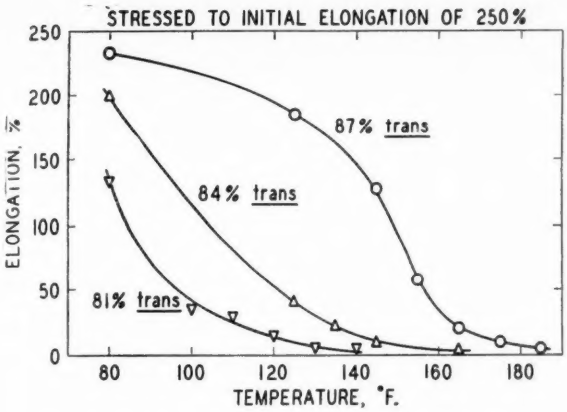

Fig. 5. Residual elongation of *trans* polybutadiene on samples cycled through heating and cooling under 250% elongation, followed by heating at various temperatures in unstressed condition

TABLE 12. EFFECT OF CURING SYSTEM USED

Basic Recipes

trans-Polybutadiene	100	100
HAF black (Philblack O)	50	50
Zinc oxide	3	—
Stearic acid	2	—
Flexamine	1	—
Sulfur	Variable*	—
NOBS Special	1.25	—
Circosol 2XH‡	—	5
Di-Cup 40 C§	—	Variable†

* 1.0, 1.75, 2.5, 3.0, 4.0, 5.0, 6.0, 7.0, and 10.0 phr.
† 1.0, 2.3, 5.0, and 10.0 phr.
‡ Sun Oil Co., Philadelphia, Pa.
§ Hercules Powder Co., Wilmington 99, Del.

Effect of Crystallinity

At room temperature *trans*-polybutadiene vulcanizates are crystalline in nature and, when compressed or elongated, will remain in this deformed condition until heated. On heating, the deformed specimen will return to near its original shape. Similarly, if a *trans*-polybutadiene vulcanizate is deformed at elevated temperature, then cooled, the specimen will remain in the distorted condition until heated. Studies were conducted to determine the recovery of compressed or elongated specimens as well as the retractive force exerted by an elongated specimen when it was heated.

Several strips of stock (approximately 1.0- by 0.08- by 0.08-inch) were elongated 250%, heated five minutes at 212° F. in the elongated condition, and allowed to cool to room temperature. Individual specimens were then released and placed into an oven for 10 minutes. With successive samples the oven temperature was increased, usually by 10° increments, and the amount of residual elongation recorded. Compounds were black-reinforced with no softener (see the recipe with 1.75 phr. sulfur in Table 12). Results of this investigation are

TABLE 13. PROPERTIES OF *trans*-POLYBUTADIENE* AT EQUAL CROSS-LINKING, USING DIFFERENT CURING SYSTEMS

Cross-linking x 10^4, moles/cc.	1.0		2.0		3.5	
Curative, type	Sulfur	Di-Cup	Sulfur	Di-Cup	Sulfur	Di-Cup
Phr.	1	2.3	2.5	5	6	10
Mooney scorch @ 280° F., min. to 5-pt. rise	22.5	11.0	14.5	7.0	13.0	5.5
(30 Minutes' Cure at 307° F.)						
Compression Set,† %	22	4	12	1	15	2
100% modulus, psi.	800	960	650	900	930	1570
Tensile, psi.	1850	2410	3110	2730	2580	1780
Elongation, %	550	470	390	250	190	120
Heat build-up, °F.	179	96	64	55	32	29
Resilience, %	67	67	67	71	79	79
Shore A hardness	95	97	91	95	78	86
(Oven Aged 24 Hours at 212° F.)						
Tensile, psi.	3250	2510	3040	2700	1990	1590
Elongation, %	425	460	270	240	120	100

* 84% *trans* configuration; 20 ML-4 at 212° F.
† Method No. 1 of Test Methods in Appendix.

TABLE 14. RECOVERY OF DEFORMED *trans*-POLYBUTADIENE PELLETS

(30 Minutes' Cure at 307° F.)

% of Original Height

After Compression	After Recovery
10	55
14	74
19	93
30	98
51	99

plotted in Figure 5. As expected, the higher *trans* content polymers will retain a greater percentage elongation at 80° F. To destroy the crystallinity of the *trans*-polybutadiene vulcanizates, temperatures must be raised in proportion to the *trans* content.

To measure the amount of pull of an elongated sample of crystallized *trans*-polybutadiene, a tensile dumbbell was elongated at room temperature; the elongated sample was placed into the jaws of a hot tensile machine, and the specimen drawn taut. The conditioning temperature was then raised to 200° F., and the pull of the tensile specimen recorded. With a black-reinforced stock at 200% elongation the retractive force was 170 psi. This pull of an elongated specimen is considerably lower than the 200% modulus at 200° F. (580 psi.).

To determine the extent to which *trans*-polybutadiene vulcanizates could be compressed, yet still recover, hysteresis pellets were compressed at 300° F. and cooled in the compressed position. The deformed pellets were removed from the press, measured, and placed into a 300° F. oven for 30 minutes, after which the pellets were cooled and remeasured. The recovery shown by a black-

TABLE 15. RECOVERY OF COMPRESSED PELLETS AFTER SHELF AGING

% of Original Height after Compression	Days Aged	% of Original Height: After Aging & before Heating	% of Original Height: After Recovery
26	1	26	93
26	3	28	96
26	7	26	93
26	14	26	93
26	28	26	94
26	84	26	92

TABLE 16. PHILPRENE IN X-10 SHOE SOLES

Philprene X-10	100	100	100	60	50	30	—
SBR 1502	—	—	—	40	40	60	80
High styrene resin	—	—	—	—	10	10	20
Sulfur	2.1	4	6	2.1	2.1	2.1	2.1
Compression set* at 212° F., %	47	33	32	31	27	30	28
100% modulus, psi.	—	—	1250	680	760	600	630
Tensile, psi.	—	1200	1400	730	760	730	860
Elongation, %	—	60	170	120	100	200	300
Tensile, 200° F., psi.	150	450	780	260	260	550	300
Tear strength, 80° F., lb./in.	175	190	305	195	200	195	225
200° F., lb./in.	20	90	120	50	55	60	75
Shore A hardness	97	98	98	93	95	89	92
Lupke rebound, %	61	62	65	65	57	58	51
NBS abrasion, rev./mil.	1.86	3.62	6.65	2.71	2.65	2.54	1.78

Stocks cured 15 minutes at 320° F. Basic recipe as follows:

Rubber plus resin	100
Reogen†	2.5
Stearic acid	1.5
Zinc oxide	3
AgeRite Stalite†	1
Cumar MH-2½‡	10
Medium process oil	2.5
Paraffin	1
Cotton flock	4
Dixie clay†	90
Silene EF§	40
Sulfur	variable
Altax†	1.3
Methyl Zimate†	0.4

* Method No. 1 of Appendix on Test Methods.
† R. T. Vanderbilt Co., New York 17, N. Y.
‡ Allied Chemical Corp., plastics & coal chemicals division, New York 6.
§ Columbia-Southern Chemical Corp., Pittsburgh 22, Pa.

TABLE 17. CELLULAR SOLES

	Sports Soling*: Philprene X-10	Sports Soling*: SBR 1503	Hard Soling†: Philprene X-10	Hard Soling†: SBR 1503
Specific gravity	0.942	0.965	1.039	1.161
Compression set, 80° F., %‡	68	18	80	47
212° F., %§	23	20	20	20
Deflection in compression set test, %	58	52	50	41
100% modulus, psi.	480	350	840	830
Tensile, psi.	480	580	840	1060
Elongation, %	160	340	105	260
Tear strength, 80° F., lb./in.	145	140	280	240
200° F., lb./in.	60	45	65	60
Lupke rebound, %	65	64	51	51
Shore A hardness	70	65	98	97
NBS abrasion rev./mil.	1.03	<1	1.82	1.05

* Press cure for 12 minutes at 324° F., followed by oven cure for 5 hours at 212° F., in following recipe:

Polymer	100
High styrene resin	20
Zinc oxide	5
AgeRite Stalite	2
Silene EF	25
Suprex Clay[a]	60
Cotton flock	10
Cumar MH-2½	6
Medium process oil	10
Stearic acid	3
Titanium dioxide	5
Altax	1.25
Methyl Tuads[b]	0.3
N,N'-diphenylguanidine	0.3
Celogen[c]	6
Sulfur	3

[a] J. M. Huber Corp., New York 17.
[b] R. T. Vanderbilt Co.
[c] Naugatuck Chemical.

† Press cure for 10 minutes at 316° F., followed by oven cure for 5 hours at 212° F., in following recipe:

Polymer	100
High styrene resin	50
Zinc oxide	5
AgeRite Stalite	2
Silene EF	75
Suprex Clay	10
Cotton flock	10
Cumar MH-2½	6
Medium process oil	10
Diethylene glycol	3
Stearic acid	2
Titanium dioxide	4
Altax	1.25
N,N'-diphenylguanidine	1.5
Celogen	4.5
Sulfur	3

‡ Method No. 3 of Test Methods in Appendix.
§ Method No. 1 in Appendix.

reinforced 87% *trans*-polybutadiene vulcanizate is shown in Table 14.

It would appear from these data that below a certain percentage compression bonds are broken such that recovery is poor. It has been observed that the higher *trans* configuration rubbers can be compressed further and still recover, compared to stocks of lower *trans* content.

To determine how long the distorted pellet could be aged, yet recover, pellets were compressed to approximately 25% of their original height and allowed to rest 1, 3, 7, 14, 28, and 84 days before heating. The results are tabulated in Table 15.

The height of the compressed pellets did not change when conditioned up to 84 days at room temperature. Also, the conditioning period did not affect the recovery of the pellets when subjected to heating.

The rapid crystallization of high-*trans* polybutadiene

TABLE 18. FLOOR TILE STOCKS

Stock	A	B	C	Control
Compression set*				
at 80° F., %	2	3	11	13
212° F., %†	25	27	49	52
300% modulus, psi.	—	—	750	1000
Tensile, psi.	1550	1540	1350	1010
Elongation, %	65	60	575	315
Tear strength, lb./in.	345	355	195	250
Shore A hardness	98	100	85	94
NBS abrasion, rev./mil.	4.92	2.70	1.62	0.90

* Method No. 2 in Appendix on Test Methods.
† Method No. 1 in Appendix.

and the change to an amorphous condition upon heating will affect properties of compounds containing this material, such as tensile strength, hardness, and compression set. This rapid crystallization, and the resultant effect on properties, may prove to be an asset in certain applications and in others may be undesirable. Variation in the amount of cross-linking, as discussed under "Effect of Curing Systems," provides considerable control over the degree of crystallization.

Possible Applications

Polybutadienes of high *trans* configurations were utilized in several specific types of formulations to establish possible areas of application. The high hardness, excellent abrasion resistance, and recovery properties of Philprene X-10 imply its use in shoe soles, floor tile, and gasket stocks, either as the base rubber or for the modification of other polymers. In addition to the above properties, the thermoplastic nature and good extrusion characteristics of this polymer should make Philprene X-10 suitable for a number of other extruded or molded products.

Shoe Sole Stocks

SOLID SOLING. Properties of shoe soles based on Philprene X-10 in a standard-grade formulation are shown in Table 16. Stocks containing high-*trans* polybutadiene as the only polymer tend to be brittle at the normal sulfur level (2.1 phr.), but become tougher and more pliable as the sulfur level is increased. The stock containing 6 phr. sulfur was better than the SBR 1502 control in almost all of the properties measured and was particularly resistant to abrasion (NBS method).

Desirable properties can also be achieved by proper selection of ratios of Philprene X-10, SBR 1502, and high styrene resin. Several examples of the latter are also included in Table 16.

CELLULAR SOLING. Data shown in Table 17 show Philprene X-10 gives properties generally suitable for cellular shoe soles with better resistance to wear than SBR 1503. The high compression set for the Philprene X-10 stock at room temperature may be undesirable; however, this tendency can probably be reduced by changes in the formulation. In fact, properties might be altered considerably by variations in the amount of ingredients such as high styrene resin and sulfur.

TABLE 19. PROPERTIES OF GASKET STOCKS

Philprene X-10	100	—	—	50	50
Nitrile-butadiene rubber*	—	100	—	50	—
Butyl rubber†	—	—	100	—	50
Compression set‡ at 212° F., %	1	1	18	1	9
100% modulus, psi.	1790	340	500	1340	1375
Tensile, psi.	2050	1710	1490	1440	1750
Elongation, %	120	285	335	105	155
Tear strength, lb./in.	160	230	220	145	250
Shore A hardness	86	61	76	81	87
Swell, % (after 7 Days' Immersion at 80° F. in Following Fluids)					
30% ammonium hydroxide	4	15	3	9	5
33% sulfuric acid	−1	2	0	−1	0
98% sulfuric acid	All became brittle and broke				
70% nitric acid	Dissolved		16	Dissolved	
Glacial acetic acid	9	33	14	7	47
Methanol	0	−1	1	−10	1
Acetone	10	124	9	25	12
n-Heptane	55	85	131	20	85
Toluene	122	168	141	111	131
Carbon tetrachloride	136	93	190	109	158

All stocks cured 45 minutes at 307° F. Complete recipes were as follows:

Philprene X-10	100.00	—	50.00	—	50.00
NBR	—	100.00	50.00	—	—
Butyl rubber	—	—	—	100.00	50.00
FEF black§	60.00	60.00	60.00	60.00	60.00
Zinc oxide	5.00	5.00	5.00	20.00	20.00
Stearic acid	2.00	1.00	2.00	—	2.00
B-L-E‖	1.00	3.00	1.00	1.00	1.00
Red lead	—	—	—	10.00	10.00
Plasticizer SC ¶	—	20.00	20.00	—	—
Altax	3.00	3.00	3.00	—	—
Methyl Tuads	2.00	2.00	2.00	—	—
Dibenzo GMF‖	—	—	—	6.40	6.40
Sulfur	2.00	0.25	2.00	2.00	2.00

* Rubber copolymer of medium high acrylonitrile content (35-40% bound acrylonitrile).
† Approximately 1.5% unsaturation.
‡ Method No. 1 of Test Methods in Appendix.
§ Philblack A, Phillips Chemical Co.
¶ Harwick Standard Chemical Co., Akron 5.
‖ Naugatuck Chemical.

Floor Tile Stocks

Tile stocks, Samples A, B, and C, containing *trans*-polybutadiene were compared to a control compound based on SBR 1502 with 30 phr. high styrene resin. Stocks A and B gave lower compression set, higher tensile and tear strength, shorter elongation, equal or higher hardness and better abrasion resistance than the SBR 1502 control (see Table 18). The low compression set of stocks A and B containing the Philprene X-10 is noteworthy and indicates these stocks should be resistant to dents caused by heavy furniture or machinery. Properties more similar to the SBR control were ob-

TABLE 20. PHILPRENE X-10 IN SPONGE STOCK

	Philprene X-10	SBR 1010
Specific gravity	0.468	0.460
Estimated, expansion, %	310	250
100% modulus, psi.	70	30
Tensile, psi.	150	60
Elongation, %	705	275
Tear resistance, lb./in.	30	6
Lupke rebound, %	69	65
Shore A hardness	18	7

Stocks cured 20 minutes at 328° F. The following recipe was used:

Polymer	100.0
Zinc oxide	5.0
Celogen	1.5
Titanium dioxide	20.0
Mineral oil	3.0
Plasticizer SC	20.0
Purecal U*	30.0
Antioxidant 2246†	0.5
Stearic acid	2.0
Monex‡	0.3
Trimene base‡	1.5
Sulfur	2.5
Paraffin wax	2.0

* Wyandotte Chemical Corp., Wyandotte, Mich.
† American Cyanamid Co., Bound Brook, N. J.
‡ Naugatuck Chemical.

tained with stock C. Stock C, however, was softer and had better abrasion resistance than the control.

Gasket Stocks

In gasket stocks, Philprene X-10 gave higher modulus and hardness than butyl rubber or a nitrile-butadiene rubber (NBR) copolymer containing about 35% bound acrylonitrile (Table 19). The latter rubber and Philprene X-10 were equivalent in compression set. In most of the chemicals used, Philprene X-10 displayed equal or better resistance to swelling at 80° F. than either butyl or nitrile-butadiene rubber. This is probably due, in part, to the crystalline nature of Philprene X-10, and the chemical or solvent resistance may decrease above the softening point of the compound.

Blends of butyl with unsaturated rubbers frequently give poorly cured stocks, and the good properties obtained with the blend of Philprene X-10 with butyl are of interest. Although not shown, heat generation and resilience of the blend were quite similar to those of butyl rubber.

Sponge Compounds

Only a cursory investigation of Philprene X-10 in sponge stocks has been made to date. The sponge samples obtained have shown uniform cell size. With normal curative levels the sponge produced is firmer than one based on SBR 1010; however, softer sponge can be made by increasing the sulfur or plasticizer level. A sponge produced from Philprene X-10 displayed higher modulus, tensile strength, elongation, tear strength, and hardness than a similar product made from SBR 1010 (see Table 20).

Miscellaneous Applications

High modulus and hardness and low compression set have been shown to be characteristic of Philprene X-10. This condition led to the consideration that *trans*-polybutadiene might be used in blends to alter these characteristics in other rubbers. For example, in 1:1 blends with natural rubber physical properties are altered as shown below:

	NR	1 : 1 NR Philprene X-10
Compression set,* %	16	11
300% modulus, psi.	1455	1565
80° F. tensile, psi.	3700	3175
400° F. tensile, psi.	275	525
Shore A hardness	62	77
Heat build-up, °F.	44	55

* Method No. 1 of Test Methods in Appendix.

Similarly, 1:1 blends of Philprene X-10 and SBR 1500 or SBR 1712 resulted in lower compression set, higher tensile at 400 F., and higher Shore hardness than were displayed by the SBR rubbers alone. Compression of blends of Philprene X-10 and butyl or nitrile-butadiene rubbers is shown in Table 19.

Employing a slightly higher than normal sulfur level in Philprene X-10 clay-loaded insulation stocks resulted in compounds which displayed physical and electrical properties nearly equal to those shown by a SBR 1503 compounded with slightly lower, but conventional sulfur levels. The thermoplastic nature of *trans*-polybutadiene makes it uniquely suited for certain other electrical product applications. A low mooney high-*trans* polybutadiene in a flexible cord-jacket compound extruded at 82 grams per minute, compared to 34 grams per minute for SBR 1502 when compounded similarly.

Summary and Conclusions

High *trans* configuration in polybutadiene results in polymers which resemble balata and gutta percha, naturally occurring *trans*-polyisoprenes, in certain physical properties. Pilot-plant quantities of high-*trans* polybutadienes have been compared for evaluation in order to determine potential end-uses for such materials. Polymers having a *trans* configuration of approximately 90% have been designated Philprene X-10 and have been found to possess a versatile combination of properties including high hardness and modulus and relatively high tensile strength.

Philprene X-10 rubbers are hard and boardy in the raw state at room temperature, but are thermoplastic and are therefore easy to mill, extrude, and mold at elevated (180° F. and higher) temperatures.

High *trans*-polybutadiene rubbers are vulcanizable with conventional sulfur-accelerator curing systems or with dicumyl peroxide. The crystalline nature of high-*trans* polybutadiene usually persists, to a degree, after vulcanization. Gum stocks prepared from Philprene X-10 display physical properties equivalent and in some

respects superior to those of SBR, but are generally inferior to those of natural rubber. Black-reinforced Philprene X-10 vulcanizates are characterized by high modulus and Shore hardness and by excellent laboratory abrasion resistance.

The unique physical properties of Philprene X-10 rubbers should be of particular interest to the producers of industrial rubber products. High-*trans* polybutadienes, alone and in admixture with other polymers, should find application in specialty items such as floor tile, gasket stocks, golf-ball covers, battery cases, shoe soles, and miscellaneous molded or extruded goods.

Acknowledgment

The authors wish to express their appreciation to W. B. Reynolds and W. W. Crouch for their counseling and direction in this program. We also wish to acknowledge the development of the polymerization techniques by J. N. Short and C. A. Uraneck and the preparation of the polymers by J. H. Carroll and coworkers. Recognition is also given to C. C. Biard and E. H. Galloway, who directed the physical testing.

APPENDIX

Test Methods Used

1. Compression Set—ASTM D 395-55 Method B, modified (0.325-inch spacers), compressed two hours at 212° F. plus relaxation for one hour at 212° F.
2. Compression Set—ASTM D 395-55 Method A, external loaded, 400 psi. load for 7 days at 80° F.
3. Compression Set—ASTM D 395-55 Method B, modified (0.325-inch spacers), compressed 72 hours at 80° F. and relaxed 24 hours at 80° F.
4. Tensile Test—ASTM D 412-51T, Scott Tensile Machine, L6 or L8. Tested at 80° F. unless otherwise designated.
5. ΔT. F. Heat Build-up—Goodrich Flexometer, 143 psi. load, 0.175-inch stroke. ΔT equals rise in temperature above 100° F. oven in 15 minutes.
6. Resilience—ASTM D 945-55, modified, Yerzley oscillograph. Test specimen, right circular cylinder 0.70-inch diameter and 1.0-inch height.
7. Resilience—Lupke Rebound, "Vanderbilt Rubber Handbook," p. 220 (1958).
8. Shore Hardness—ASTM D 676-58T, Shore durometer, Type A. 80° F. test temperature, unless otherwise noted.
9. Compounded Mooney—ASTM D 927-57T, Mooney viscometer, small rotor, 1.5 minutes, 212° F. temperature, unless otherwise noted.
10. Raw Mooney—ASTM D 927-57T.
11. Extrusions—No. ½ Royle extruder with Garvey die (13).
12. Cross-linking—Determined from reciprocal volume swell and equilibrium modulus (14-16).
13. Flex Life—ASTM D 813-57T, modified, DeMattia tester, three-inch stroke, three-inch wide test specimen with three pierces in groove. 400 flexures per minute at 210° F. Reported as thousand flexures to one-inch break.
14. Mooney Scorch—ASTM D 1077-55T, Mooney viscometer, large rotor. Scorch is minutes to five-point rise above minimum Mooney.
15. Oven Aging—Geer oven, forced draft, at 212° F. for designated time.
16. NBS Abrasion Resistance—ASTM D 394-47 Method B.
17. Tear Strength—ASTM D 624-54, razor-nicked crescent specimen.

Bibliography

(1) G. Kraus, J. N. Short, V. Thornton, *Rubber & Plastics Age*, 38, 880 (1957).
(2) H. E. Railsback, W. T. Cooper, and N. A. Stumpe, *Ibid.*, 39, 867 (1958).
(3) H. E. Railsback, *Rubber Age (N. Y.)*, 84, 967 (1959).
(4) W. W. Crouch, G. R. Kahle, *Petroleum Refiner*, 37, 187 (1958).
(5) J. N. Short, G. Kraus, R. P. Zelinski, F. E. Naylor, *Rubber Chem. Tech.*, XXXII, 2, 614 (1959).
(6) Industry News, Rubber World, 138, 761 (1958).
(7) F. W. Stavely and coworkers, *Ind. Eng. Chem.*, 48, 778 (1956).
(8) S. E. Horne, Jr., *et. al.*, *Ibid.*, 48, 784 (1956).
(9) L. Cook, *Rubber Age (N. Y.)*, 77, 872 (1955).
(10) G. Natta, *Rubber & Plastics Age*, 38, 495 (1957).
(11) G. Natta, *Angew. Chem.*, 68, 393 (1956); *Modern Plastics*, 34, 169 (1956).
(12) G. Natta, L. Porri, P. Corradini, D. Morero, *Chim. e industria (Milan)*, 40, 362 (1958).
(13) *Ind. Eng. Chem.*, 34, 1309 (1942).
(14) P. J. Flory, J. Rehner, Jr., *J. Chem. Phys.*, 11, 521 (1943).
(15) P. J. Flory, *Ibid.*, 18, 108 (1950).
(16) G. Kraus, Rubber World, 135, 67, 254 (1956).

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Safety Habits Reduce Falls

Falls are second only to motor-vehicle accidents as a leading cause of accidental deaths and injuries, according to the National Safety Council's Rubber Section *Newsletter*, April, 1960. Greater attention to hazardous situations, proper instructions, and follow-ups can eliminate many of them.

In general, six basic causes separately or in combinations can result in accidental falls: slips, trips, breaks or failures of equipment, sudden motion, inattention, and unsafe practices. These are among the outstanding problems confronting the safety engineer today.

One rubber company reported several accidents which could have been prevented if accident-prone situations had been recognized in advance. One case involved two men who were working on the top of a three-tier tubular scaffold. A third man started to climb the scaffold on the outside, thereby tripping it over. The three men suffered disabling injuries from this fall.

In another incident, oil leaking from a compressor was either not noticed in time or ignored until an employe slipped on the oily floor and broke his arm.

A third accident developed when an electrician used the top half of an extension ladder when replacing an old light bulb. Since the ladder was not stable enough for this function, it slipped, and the electrician sustained a fractured ankle from his fall.

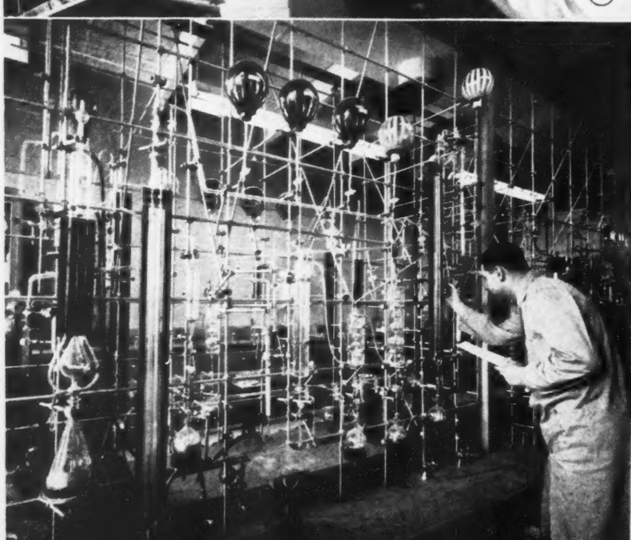
Inattention to an obvious hazard created another accident. This time a loosened piece of grating above a small trench was ignored until it resulted in another instance of a fractured ankle.

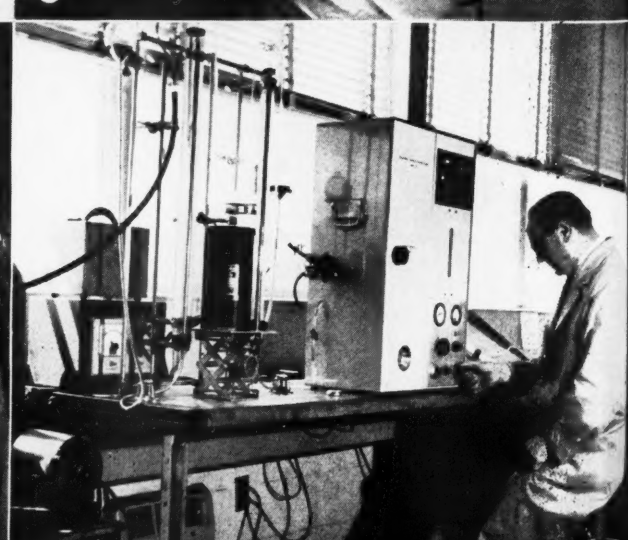
These are only a few incidents from a single company. All of them could have been avoided by the employe's attention to his own past experience and that of other workers' accidents, together with a bit of advance analysis of a potentially dangerous situation, and some common sense. To reduce falls many companies are publicizing safety methods and practices among the employes of their plants and are giving instruction, training, and supervision in an effort to create greater awareness of dangers.

Carbon Black Research Is Productive at Columbian

New lower structure Neotex blacks for better ride and wear

CARBON black, a very basic ingredient in the rubber industry, has not been left behind with regard to development and research in its manufacturing processes and improvement in those properties important to the





rubber compounder. Recent developments have been made which will help alleviate the cost pinch of natural gas supplies and at the same time produce blacks which, by use of the latex masterbatching technique, provide ride, noise, and wear qualities not possible in blacks suitable for dry mixing.

Using the properties of fineness (particle size) and oil absorption (structure) to chart the position of carbon blacks in relation to each other, a series of relations can be drawn to show relative improvement of ride properties, modulus, and wear resistance as the particle size gets smaller and as the structure is lowered.

Three blacks in this range of size and structure have been developed by Columbian Carbon Co., New York, N. Y. Trade marked Neotex 100, 130, and 150, these carbon blacks are in the same fineness range as HAF, ISAF, and SAF, respectively, but with lower structure. (Additional information on these new grades will be found in the New Materials section of this issue—Editor.)

The Columbian Carbon research laboratories, where much of the work on these new blacks was done, have been located for somewhat more than a year in new buildings on a 14-acre plot on Plainsboro Road, just off U. S. Highway No. 1, and within two miles of Princeton, N. J. This area has developed rapidly as a center for leading industrial research activities, and the availability of academic and other scientific facilities in the vicinity is advantageous. Other important considerations for this location are adequate space for growth in an essentially rural atmosphere and proximity to the company's main offices in New York, N. Y.

The program at Columbian's new research laboratories includes all phases of research on development, evaluation, and application of the company's carbon black and pigment products, including provision for technical service requests from customers in the rubber and non-rubber fields. In addition, facilities have been provided for research on new products.

The design comprises two one-story brick and glass buildings connected by a 10-foot corridor (Figure 1). The interior is as free as possible from bearing walls to provide for flexibility for future rearrangement of partitions and for expansion. The basement is designed for access to under-floor area for service installation and for ready maintenance of service.

Building No. 1 is 60 by 200 feet and contains the main entrance, reception area, administrative offices, library (Figure 2), file rooms, and a group of six laboratories devoted to basic chemical and physical research activities. Four of the laboratories for analytical research, physical-chemical, organic-polymer, and colloid work are identical in size, 38 by 20 feet; while the physical laboratory, 38 by 30 feet, contains areas for specimen preparation for microscopic and X-ray study of pigments and dispersions (Figure 3), electron microscopes (Figure 4), and a dark room. Equipment is available in the physical-chemical laboratory for the measurement of size and structure of particles of carbon black and other pigments by the gas absorption method (Figure 5). Another large laboratory is devoted to regular analytical work. Of course, this description is only

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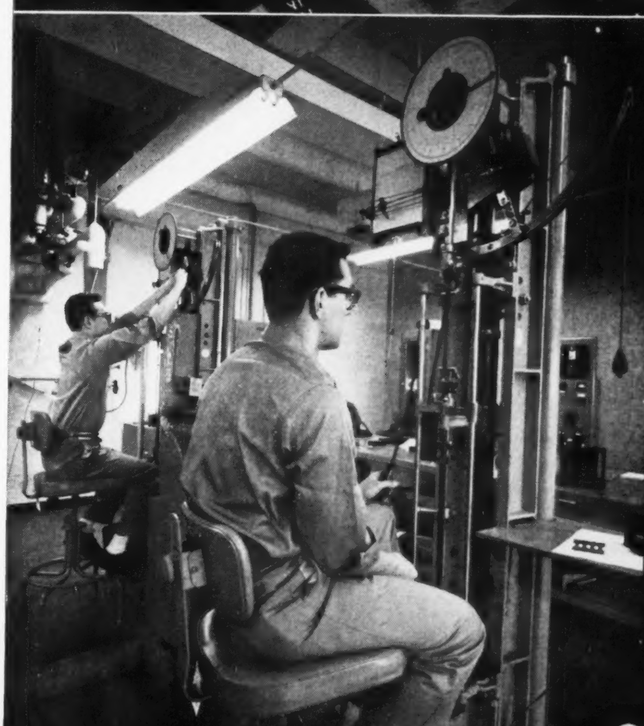
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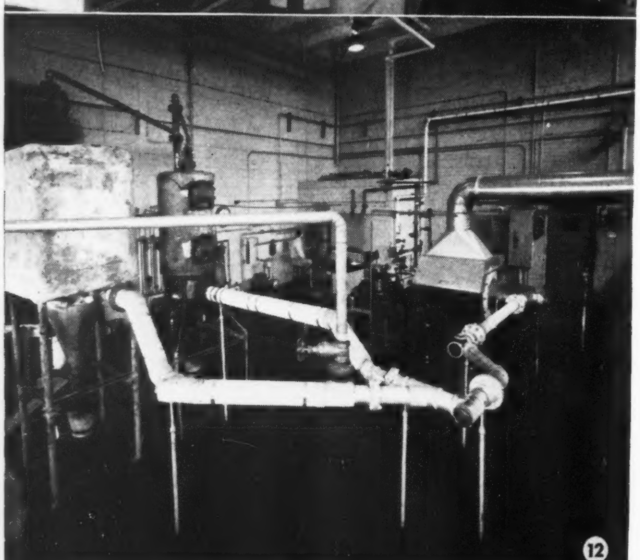

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a partial and brief one of the facilities and fields of interest of Columbian Carbon in basic chemical and physical research where this company has pioneered in the use of the electron microscope and in developing new concepts of structure and the effect of pH in carbon black research.

Building No. 2 measures 180 by 100 feet and contains seven large laboratories for development and application research, a large conference room, machine and maintenance shops, and shower and locker rooms. Figure 6 shows equipment used for the analysis of gases removed from carbon black, which is located in one of the laboratories in this building. The two largest laboratories in Building No. 2 are assigned to the rubber division. There is a basement storeroom connected by dumbwaiter with the weighing and compounding room. Mixing facilities include a laboratory Banbury (Figure 7), and in the press room the presses and accessory equipment are housed in a separate enclosed area so that excessive heat and humidity are not present in this room (Figure 8). The testing area contains such equipment as the tensile and stress-strain machines shown in Figure 9, the flexometers and flex cracking equipment shown in Figure 10, and many other pieces of equipment required for the complete evaluation of rubber stocks.

Of the remaining laboratories in this building, two are used for development and process studies on pigments, and two for application research and technical service for the printing ink, paint, protective coatings, and plastics fields (Figure 11). One laboratory is a pilot-plant area designed for flexibility for any type of pilot-scale operation including the manufacture of development quantities of carbon blacks (Figure 12).

Air conditioning is available throughout Building No. 1 and throughout all of Building No. 2, except for the pilot-plant area and several areas with excess furnace or steam equipment where adequate air circulation is provided.

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Extruder for Retread Plants

A novel extruder which was designed in England to enable a tire retreader to extrude tread stock to the size desired and in amounts needed at the time might also be of considerable interest to other extruders. Major new feature of the extruder is a breech-type opening at the back of the barrel, leaving an open, clean bore for easy cleaning as well as easy loading of raw stock.

For retreading operation the basic rubber compound is bought in sheets, warmed in a special oven, rolled into a 90- to 100-pound pig, and fed into the extruder. The hydraulically driven extruder then produces the desired size and amount of tread rubber. Details of this operation will appear next month.

Research Enterprises, Inc., Manchester, N. H., will be selling this extruder in the United States.

(Charles Mayer Studios)

Ralph F. Wolf

Non-Discoloring Promoters Of Butyl Rubber-Reinforcing Silica Thermal Interaction

Phenol dialcohols, an organic sulfide, organic peroxides, and urea found to be effective

By RALPH F. WOLF[1]

Columbia-Southern Chemical Corp., Barberton, O.

HEAT treatment of butyl rubber-carbon black mixtures is reported to result in great improvement in the chemical and physical properties of the resulting vulcanizates.[2]

Similar improvement can be obtained in butyl rubber compounds loaded with precipitated hydrated silica (Hi-Sil 233),[3] but promoters must be used to bring about the thermal interaction between rubber and pigment. In the case of butyl rubber-carbon black mixtures, promoters are not needed.

P-quinone dioxime (GMF),[4] p-quinone dioxime benzoate (Dibenzo GMF),[4] and p-dinitroso benzine (Polyac),[5] are effective promoters of the thermal interaction between butyl rubber and Hi-Sil.[6] An objection to all of these promoters is the fact that they cause severe discoloration which cannot be completely masked in the resulting vulcanizate. Consequently, if these promoters are used, satisfactory white or light-colored goods cannot be made except by the addition of excessive amounts of expensive titanium dioxide. The desirability of finding promoters which will not cause this discoloration is obvious.

Several materials have been found which appear to promote the thermal interaction of Hi-Sil and butyl rubber and improve the physical properties of the resulting vulcanizates without causing any discoloration, or at worst, only very slight discoloration. Phenol dialcohols, which are used in the "resin" cure[7] of butyl rubber, and morpholine disulfide are particularly effective in improving physical properties of silica-loaded butyl rubber compounds vulcanized either with sulfur alone or with combinations of sulfur and organic sulfides. Urea and cumene hydroperoxide are also effective in this connection, but to a lesser extent.

Promoters in Enjay Butyl 268[8]—First Series

Initially 24 materials were tested in a straight sulfur cured, Hi-Sil 233-loaded butyl rubber stock. The mixtures of Enjay Butyl 268, Hi-Sil 233, and promoter were made in a size B laboratory Banbury mixer rather than on an open mill, in order to get more reproducible results. The mixer was heated to 300° F. before the butyl rubber, Hi-Sil 233, and promoter were added at the beginning of the mixing. The formula for this masterbatch was as follows:

Enjay Butyl 268	100.0
Hi-Sil 233	50.0
Glycerol	3.0
Promoter	1.0 (except as noted below)

All of the promoters listed in Table 1 were used at the one phr. level except for the combinations of Amberol ST 137[9] plus Neoprene GN[10] and the Amberol ST 137 plus "Hypalon" SC[10] plus zinc oxide. In these two cases, one phr. of each material was used.

The glycerol was used to prevent sticking of the batch in the Banbury and, subsequently, on the mill. The above ingredients were mixed for 10 minutes in the hot Banbury; the temperature was allowed to rise at will until it tended to go above 380° F., in which case cooling water was turned on. After 10 minutes in the hot Banbury, the batch was dumped and cooled. It was finished later, in the Banbury, according to the following recipe:

Heat treated masterbatch	154.0
Zinc oxide	5.0
Titanium dioxide	2.0
Sulfur	2.0
TMTDS (tetramethylthiuram disulfide	2.0
Paraffin wax	0.75

Four compounds were run to serve as bench marks.

[1] Present address, The Natural Rubber Bureau, Akron 19, O.
[2] A. M. Gessler, *Rubber Age (N. Y.)*, 74, 59 (1953).
R. L. Zapp, A. M. Gessler, *Ibid.*, 74, 243 (1953).
A. M. Gessler, F. P. Ford, *Ibid.*, 74, 397 (1953).
J. Rehner, A. M. Gessler, *Ibid.*, 75, 561 (1954).
[3] Columbia-Southern Chemical Corp.
[4] Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.
[5] E. I. du Pont de Nemours & Co., Inc., elastomer chemicals department, Wilmington, Del.
[6] A. M. Gessler, J. Rehner, *Rubber Age (N. Y.)*, 77, 875 (1955).
A. M. Gessler, H. K. Wiese, J. Rehner, *Ibid.*, 78, 73 (1955)
[7] United States patents Nos. 2,701,895; 2,726,224; 2,727,874; 2,734,039; 2,734,877, and 2,749,323, assigned to United States Rubber Co.
[8] Enjay Co., Inc., New York 19, N. Y.
[9] Rohm & Haas Co., Philadelphia, Pa.
[10] Du Pont elastomer chemicals department.

Table 1. Classification of Promoters of Thermal Interaction According to Amount of Discoloration Produced

Enjay Butyl 268 and Hi-Sil 233 (Sulfur Vulcanization)

Trade or Chemical Name	Chemical Type
Group 1. Equal in Color to Control Containing No Promoter	
Control, no promoter	—
Sulfasan R[a]	organic sulfide (morpholine disulfide)
Amberol ST 137, "Hypalon" SC, zinc oxide	phenol dialcohol, chlorosulfonated polyethylene, zinc oxide
Amberol ST 137	phenol dialcohol
Cumene hydroperoxide	organic peroxide
Urea	amide
Di-Cup[b]	organic peroxide (dicumyl peroxide)
Group 2. Slightly Darker than Control, but Satisfactory for White or Colored Goods	
Bakelite BR 10282[c]	phenol dialcohol
" 14634[c]	phenol dialcohol
Hexachlorphenol	organic halide
Vultac No. 1[d]	organic sulfide (alkyl phenol sulfide)
Group 3. Slightly Darker than Group 2, but Satisfactory for Light-Colored Compounds	
VA-7[e]	organic sulfide (aliphatic polysulfide)
Sulfur	sulfur
Phenyl hydrazine	substituted hydrazine
Stabilite Alba[f]	secondary alkarylamine (di-o-tolyl ethylene diamine)
Group 4. Dark Tan, Usable only in Dark-Colored Goods	
Polyac	nitroso compound (p-dinitroso benzene)
Amberol ST 137, Neoprene GN	phenol dialcohol, polychloroprene
Vulklor[g]	organic halide (tetrachlor benzoquinone)
Tonox[g]	primary amine (p,p′ diamino diphenyl methane)
Hydroquinone	phenol
Permalux[h]	phenol amine salt (DOTG salt of dicatechol borate)
Group 5. Strongly Colored, Unsuitable Except for Dark-Colored Goods of Same Shade	
Dibenzo GMF	quinone salt (quinone dioxime dibenzoate); brownish-purple discoloration
GMF	quinone (p-quinone dioxime); brownish-purple
p-Nitroso dimethyl aniline	aromatic nitroso compound; dark yellow-brown
Hexanitro diphenyl amine	nitro amine; yellow-brown
p-Amino phenol	amino phenol; purple
AgeRite White[i]	secondary diaryl amine (di-beta-naphthyl p-phenylene diamine); green

[a] Monsanto Chemical Co., rubber chemicals department, Akron 11.
[b] Hercules Powder Co., Wilmington 99, Del.
[c] Union Carbide Plastics Co., Division of Union Carbide Corp., New York 17, N. Y.

These consisted of heat treated masterbatches mixed without any promoter; with one part of Dibenzo GMF; with one part of Polyac; and with one part of GMF. It was known that the last three compounds would discolor badly, but their physical properties were needed to make possible comparisons with those of the compounds containing the other promoters.

In Table 1 all of these materials are classified into five groups according to the amount of discoloration imparted to the vulcanizates and not according to the physical properties produced.

The physical properties of these compounds are compared in Table 2. The test methods of the American Society for Testing Materials were used in all cases in obtaining these results. Here it can be seen that of the materials that did not discolor, the compounds heat treated with a phenol dialcohol, morpholine disulfide, urea or cumene hydroperoxide were improved either in tensile strength, modulus, permanent set, tear resistance or in two or more of these properties over the control compound which had been heat treated without promoter. In the case of dicumyl peroxide, the amount used (one phr.) was apparently too much and caused degradation of the rubber. The two outstanding non-discoloring promoters appear to be Amberol ST 137 and Sulfasan R. The former produces the greater improvement in tensile and tear strengths, and the latter the higher modulus.

In Group 2 the most effective promoters were two Bakelite resins, which like Amberol ST 137, are also phenol dialcohols. Each of these gave modulus values more than double that of the control compound and also caused modest increases in tensile strength and tear resistance.

None of the Group 3 materials were particularly effective as judged by the physical properties obtained in comparison with those of the control compound. Sulfur and VA-7 caused some increase in modulus values, but at the cost of a slight loss of tensile strength. The sulfur compound contained a total of three parts of sulfur, one of which was added as a promoter during the hot mix step, and the other two parts during the final mix.

Among the Group 4 materials, Polyac was outstanding in that it gave a higher modulus value than any material in the first three groups, without much loss of tensile strength or tear resistance. As expected, it caused a tan discoloration which would preclude its use in white or very light-colored stocks.

Of the Group 5 materials, Dibenzo GMF gave properties almost identical with those of the Polyvac stock, but the resulting compound was much more seriously discolored. As expected, GMF gave the highest modulus

[d] Pennsalt Chemicals Corp., industrial chemicals division, Philadelphia 2.
[e] Thiokol Chemical Corp., Trenton 7, N. J.
[f] C. P. Hall Co., Akron 8.
[g] Naugatuck Chemical.
[h] Du Pont elastomer chemicals department.
[i] R. T. Vanderbilt Co., New York 17.

and lowest set values of any of the materials tested, but the discoloration caused by this material is so great that it could only be used in articles colored dark brown, chocolate, or possibly maroon.

The initial work in this first series of experiments was done for the purpose of screening out promoters that proved to be unsatisfactory from the discoloration standpoint. The work did not prove necessarily, however, that a heat treatment was required in addition to the use of a promoter because unheated batches containing promoters were not run at the same time.

Promoters in Enjay Butyl 365—Second Series

In the second series of experiments, several materials listed in Table 1 and some additional promoters were retested in Enjay Butyl 365, a faster curing and more widely used type of butyl rubber than type 268, under the same hot mix conditions used in the first series of experiments. The results of these hot mix runs were compared with results obtained from batches mixed at a much lower temperature at the same time and containing the same additives. There were no differences in preparing the hot and cold mixed masterbatches other than the temperature of the Banbury mixer. The hot mix conditions are described under the first series of experiments; under the so-called cold mix conditions, the butyl rubber, Hi-Sil 233, glycerol and promoter were added to the Banbury mixer at room temperature, and the cooling water was turned on full during the mixing.

One important change was made in the formula used for the second series of tests. Instead of using two parts of sulfur for vulcanization of the butyl rubber, the non-blooming combination[11] of one phr. of elemental sulfur and 1.5 phr. of Sulfasan R was used. When one phr. of Sulfasan R was tested as a promoter, it was in addition to the 1.5 phr. added in the final mix.

[11] U.S. patent No. 2,821,516, R. F. Wolf, to Columbia-Southern Chemical Corp. (Jan. 28, 1958).

TABLE 2. PHYSICAL PROPERTIES OF HEAT-TREATED HI-SIL 233-LOADED ENJAY BUTYL COMPOUNDS CONTAINING VARIOUS PROMOTERS (SULFUR VULCANIZATION)

Promoter	320° F. Cure, Min.	500% Mod., psi.	Tensile, psi.	% Elongation	Shore Hardness 0 Sec.	Shore Hardness 30 Sec.	Tear, Lbs./In.	% Perm. Set[a]
			Group 1					
Control	15	990	2880	800	63	53	390	42
Sulfasan R	15	2140	2730	580	70	60	270	50
Amberol ST 137, "Hypalon" SC, ZnO	15	1790	2830	680	64	53	460	36
Amberol ST 137	15	1460	3170	780	62	52	530	37
Cumene hydroperoxide	20	1240	2030	700	73	60	340	53
Urea	15	1190	2740	770	71	60	420	52
Di-Cup	20	630	730	590	69	51	160	49
			Group 2					
BR 10282	20	2120	3010	630	70	60	420	34
14634	20	1950	3090	680	67	57	480	34
Hexachlorphenol	20	1380	2330	720	68	56	410	51
Vultac No. 1	20	1150	2210	730	70	57	390	54
			Group 3					
VA-7	30	1560	2630	700	71	60	420	48
Sulfur	30	1550	2490	680	72	53	410	45
Phenyl hydrazine	30	1200	1880	660	71	59	310	53
Stabilite Alba	20	1060	2830	780	65	55	360	45
			Group 4					
Polyac	20	2340	2480	540	71	60	380	32
Amberol ST 137, Neoprene GN	30	1810	2960	700	67	57	430	40
Vulklor	30	1620	2570	700	68	59	460	46
Tonox	30	1550	2950	720	72	60	400	43
Hydroquinone	30	1320	2890	760	71	60	430	44
Permalux	30	1310	2870	770	69	58	400	44
			Group 5					
Dibenzo GMF	20	2490	2560	520	68	59	340	31
GMF	15	1680[b]	1710	310	69	61	210	21
p-Nitroso dimethyl aniline	20	1380	2760	730	68	56	480	47
Hexanitro diphenyl amine	20	1310	2930	740	63	53	380	36
p-Amino phenol	20	1260	3020	780	69	57	440	42
AgeRite White	15	970	2800	810	67	54	410	46

[a] Measured at 75% elongation.
[b] Measured at 300% elongation.

The formula for masterbatches in the second series follows:

Enjay Butyl 365	100.0
Hi-Sil 233	50.0
Glycerol	3.0
Promoter	1.0 (except as noted below)

All of the promoters were used at the one phr. level except cumene hydroperoxide and t-butyl perbenzoate, which were used at 0.5 phr; and Di-Cup 40-C, which was used at 0.62 phr. (equivalent to 0.25 phr. of active ingredient). In the two cases where combinations of promoters were used (Amberol ST 137 plus "Hypalon;" Amberol ST 137 plus Sulfasan R), one part of each promoter was employed.

In all cases the final batch recipe was as follows:

Masterbatch (heat treated or cold mixed)	154.00
Zinc oxide	5.00
Titanium dioxide	2.00
Sulfur	1.00
Sulfasan R	1.50
TMTDS	2.00
Paraffin wax	0.75

The materials compared in the second series of tests are listed in Table 3, and a classification is made again according to the amount of discoloration imparted to the vulcanizate. It will be noted that there are some slight changes in the amount of color imparted to the vulcanizates by some of the materials in hot-mixed straight sulfur-cured stocks (Series 1, Table 1), compared with the sulfur-Sulfasan R cured compounds (Series 2, Table 3). For example, Vultac No. 1 and Stabilite Alba were slightly better in the latter than in the former, while Amberol alone or with "Hypalon," urea, and phenyl hydrazine was slightly poorer.

All of the Series 2 materials, when tested as additives in cold mixed stocks, gave cured compounds that were equal to the control in color or only very slightly creamier in color. All were, of course, lighter than their hot mixed counterparts.

The physical properties obtained for the vulcanizates in the second series of tests, both mixed hot and at lower temperature, are shown in Table 4. In every case the hot mixed stock had a higher modulus and lower elongation value than the cold mixed stock containing the same promoter, definitely indicating that a thermal interaction between the filler and the rubber had taken place.

In the Series 2-type compound, Sulfasan R proved to be the most effective promoter among the materials that caused no discoloration. Definite increases in modulus, tensile strength, and tear resistance were noted in the batch which was heat treated with this promoter.

The greatest increases in modulus values were obtained as a result of heat treatment of any of the batches containing one of the phenol dialcohol resins, that is, Amberol ST 137, BR 10282, or BR 14634, although all of these vulcanizates were slightly darker in color than the control compound. The highest modulus value was obtained in the batch heat treated with one phr. each of Amberol ST 137, "Hypalon" SC, and zinc oxide. This batch discolored slightly and would not be satisfactory for some white stocks although it would be usable for any colored goods.

TABLE 3. CLASSIFICATION OF PROMOTERS OF THERMAL INTERACTION ACCORDING TO AMOUNT OF DISCOLORATION PRODUCED

Enjay Butyl 365 and Hi-Sil 233 (Sulfur-Sulfasan R Vulcanization)

Trade or Chemical Name	Chemical Type
Group 1. Equal in Color to Control Containing No Promoter	
Control, no promoter	—
Sulfasan R	organic sulfide
Cumene hydroperoxide	organic peroxide
Vultac 1	organic sulfide
Di-Cup 40-C[a]	organic peroxide (dicumyl peroxide)
Group 2. Slightly Darker than Control, but Satisfactory for White or Light Goods	
Bakelite BR 10282	phenol dialcohol
Amberol ST 137	phenol dialcohol
Bakelite BR 14634	phenol dialcohol
Hexachlorphenol	organic halide
t-Butyl perbenzoate	organic peroxide
Urea	amide
Stabilite Alba	secondary alkarylamine
Stabilite[b]	secondary alkarylamine (diphenyl ethylene diamine)
Group 3. Slightly Darker than Group 2, but Satisfactory for Light-Colored Compounds	
Amberol ST 137, "Hypalon"	phenol dialcohol, chlorosulfonated polyethylene
Trichlormelamine	organic halide
Amberol ST 137, Sulfasan R	phenol dialcohol, morpholine disulfide
Benzotrichlortoluene	organic halide
Hexachlormelamine	organic halide
Group 4. Dark Tan, Usable Only in Dark-Colored Goods	
Phenyl hydrazine	substituted hydrazine

[a] Hercules Powder Co.
[b] C. P. Hall Co.

It is interesting to note in Table 4 that none of the promoters do anything to improve the poor rebound of butyl rubber as measured by the Goodyear-Healy pendulum,[12] indicating that this property depends on the structure of the elastomer and is not principally a function of state of cure.

Promoters in SBR 1500—Series 3

Three of the materials which had proved effective as non-discoloring promoters of the thermal interactions between butyl rubber and Hi-Sil 233 were tested for the same purpose in SBR 1500. These were Amberol ST 137, Sulfasan R, and urea. The results, shown in Table 5, indicate that none were particularly effective. Dibenzo GMF, when used as a promoter with SBR

[12] ASTM D 1054-55, American Society for Testing Materials, Philadelphia 3, Pa.

TABLE 4. PHYSICAL PROPERTIES OF HOT AND COLD-MIXED HI-SIL 233-LOADED ENJAY BUTYL 365 COMPOUNDS CONTAINING VARIOUS PROMOTERS (SULFUR-SULFASAN R VULCANIZATION)

Promoter	Mix. Conds.	320° F. Cure, Min.	500% Mod., psi.	Tensile, psi.	% Elonga-tion	Shore Hardness 0 Sec	Shore Hardness 30 Sec.	Tear, Lbs./In.	% Perm. Set	% Re-bound
				Group 1						
Control	Hot	15	1240	2280	680	72	58	270	51	30.2
	Cold	15	990	2190	710	72	61	290	57	31.5
Sulfasan R	Hot	20	1460	2570	660	74	60	320	50	32.6
	Cold	20	1030	2260	720	70	58	280	63	32.2
Cumene hydroperoxide	Hot	20	1360	1850	610	71	61	300	52	29.3
	Cold	20	1050	1870	670	72	61	260	62	32.2
Vultac No. 1	Hot	20	1300	1890	620	72	60	260	50	30.3
	Cold	20	1130	1800	640	72	61	260	47	32.2
Di-Cup 40-C	Hot	20	1160	1960	670	72	58	280	58	31.9
	Cold	20	1000	2290	720	72	61	310	58	33.7
				Group 2						
BR 10282	Hot	20	1780	2380	630	72	63	300	45	28.9
	Cold	20	1120	2180	700	73	61	250	55	28.1
Amberol ST-137	Hot	20	1760	2370	630	72	60	300	45	30.3
	Cold	20	1080	2220	700	72	58	270	51	32.9
BR 14634	Hot	20	1730	2360	620	70	60	340	45	29.3
	Cold	20	1060	2230	710	72	59	280	54	29.3
Hexachlorphenol	Hot	20	1550	2340	650	75	61	340	52	30.7
	Cold	20	1030	2150	720	73	62	280	62	32.9
t-Butyl perbenzoate	Hot	20	1380	1940	600	71	61	250	46	30.3
	Cold	20	1040	1930	670	70	60	260	56	32.2
Urea	Hot	20	1420	1880	600	73	61	240	43	30.3
	Cold	20	1180	2030	660	77	65	250	60	32.2
Stabilite Alba	Hot	20	1280	1810	590	74	62	240	39	30.7
	Cold	20	1000	1880	670	74	62	240	54	32.9
Stabilite	Hot	20	1280	1880	620	72	62	260	46	30.7
	Cold	20	1000	1880	650	72	61	230	51	32.9
				Group 3						
Amberol ST 137, "Hypalon," ZnO	Hot	20	2030	2420	590	74	63	300	41	31.9
	Cold	20	1130	2250	710	72	56	280	53	32.9
Trichlormelamine	Hot	15	1790	1920	560	73	61	310	38	33.8
	Cold	15	1250	1900	660	67	57	330	53	35.7
Amberol ST 137, Sulfasan R	Hot	20	1570	2310	620	76	62	290	42	29.6
	Cold	20	980	2090	700	74	62	270	54	32.2
Benzotrichlortoluene	Hot	20	1130	1780	630	74	61	300	45	30.3
	Cold	20	930	1770	660	70	57	260	49	32.6
Hexachlormelamine	Hot	15	1120	1170	540	69	51	200	45	30.3
	Cold	15	1040	1630	730	70	54	290	49	32.6
				Group 4						
Phenyl hydrazine	Hot	20	1250	1810	630	76	62	230	53	29.3
	Cold	20	980	1870	660	73	62	250	58	32.2

TABLE 5. PHYSICAL PROPERTIES OF HEAT-TREATED HI-SIL 233-LOADED SBR 1500 COMPOUNDS CONTAINING VARIOUS PROMOTERS

Promoter	280° F. Cure, Min.	300% Mod., psi.	Tensile, psi.	% Elonga-tion	Shore Hardness 0 Sec.	Shore Hardness 30 Sec.	Tear, Lbs./In.	% Perm. Set
Control[a]	45	500	3760	670	65	58	280	13
Control	45	520	3830	680	69	59	290	24
Dibenzo GMF	45	1160	4200	580	71	62	300	20
Amberol ST 137	45	530	3830	690	69	59	340	25
Sulfasan R	45	690	3890	630	67	58	310	22
Urea	45	590	3900	660	64	57	280	24

[a] This control batch mixed cold; the second control batch and all others mixed hot.

1500, doubled the modulus value of the silica loaded compound, but unfortunately turned it to a dark bluish-black color at the same time.

The formula for the masterbatch used in this third series of experiments was as follows:

SBR 1500	100.0
Hi-Sil 233	50.0
Glycerol	3.0
Stearic acid	3.0
Promoter	1.0

Except for a cold mixed control compound, the masterbatches in this series were all given a 12-minute mix in a laboratory Banbury mixer held at 300 to 320° F. With the control compound, the ingredients were added to the Banbury mixer at room temperature, and the cooling water was turned on full during the mixing. The order of addition of ingredients and the total mixing time were the same as for the batches mixed hot. The masterbatches on completion were cooled and after 24 hours were finished on a cool mill using the following recipe:

Masterbatch	157.00
Zinc oxide	5.00
Antioxidant 2246[13]	2.00
MBTS	0.75
DOTG	1.50
Sulfur	3.00
Triethanolamine	1.00
Cumar MH 2½[14]	10.00

It will be noted from the results in Table 5 that when no promoter was present, it made little difference whether the masterbatch was prepared in a cold or hot Banbury mixer. The results obtained with Dibenzo GMF demonstrated, however, that there are materials which effectively promote a thermal interaction between SBR and reinforcing silica. Additional work is needed to find materials that will act as promoters without causing severe discoloration of the resulting vulcanizate.

Summary and Conclusions

The physical properties of butyl rubber vulcanizates loaded with hydrated silica can be improved by heat treatment of the butyl rubber-silica masterbatch in the presence of certain promoters of thermal interaction.

P-quinone dioxime and its benzoic acid derivative and p-dinitroso benzene are effective promoters of thermal interaction, but all cause severe discoloration of the vulcanizate. Several non-discoloring promoters have been found, of which the best are phenol dialcohols and morpholine disulfide. Urea and cumene hydroperoxide are also effective in this connection.

These non-discoloring promoters are not particularly effective, however, when used during the heat treatment of silica loaded SBR compounds. P-quinone dioxime did increase the modulus value to twice that of the control compound, but the vulcanizate discolored badly.

[13] American Cyanamid Co., rubber chemicals department, Bound Brook, N. J.

[14] Allied Chemical Corp. plastics & coal chemicals division, New York 6, N. Y.

Rubber Tired, Elevated Monotrack Car Beats Traffic

Current traffic congestion coupled with the mounting problems facing urban transit systems may lend added or starting pressure for a revival of the "El" in modern dress as a means of providing fast, quiet, and frequent passenger service. This monotrack elevated line carrying suspended streamlined cars has been developed, and a one-mile test layout constructed in France.

Designer and builder of the system, according to *France Actuelle* (April, 1960), is Société Anonyme Française d'Etudes de Gestion et d'Entreprises, a productive collaboration of 18 top French enterprises, including such companies as Alsthom, Michelin, and Renault. Of major interest to rubber companies is the use of rubber tires on the two bogies that suspend the car. Each bogie consists of four auto-size vertical wheels and four small horizontal guiding wheels. The use of rubber tires on certain main-line subways in Paris has already proved practical.

The hollow welded steel beam that forms the track is supported by concrete encased steel pillars spaced almost 100 feet apart. With all control circuits and power supply lines enclosed in the beam, and the supporting posts requiring only a three-foot diameter base, the new system avoids the light blocking objections to the massive-type construction of previous elevated lines. The rubber tired operation would provide passengers and those living near the right-of-way quiet not possible with steel wheels and rails of conventional equipment.

The demonstration car is made of aluminum and resembles the long slim body of an airplane. It is 57 feet long, 10 feet wide, and 10 feet high. There is room for 32 seated and 91 standing passengers.

The lightness of the car, the traction of the rubber tires, the power of the motors, the double braking system —pneumatic and rheostatic (action on the motors)— permit rapid acceleration, high cruising speed, and quick slowing down. This high speed and frequency of the cars (one every 90 seconds) would be made safe by the application of the latest-best in control. Signals on the line are reproduced in the engineer's cabin; the emergency brake goes on automatically if a signal is passed; and the engineer is in constant telephonic communication with the traffic dispatcher on his line.

Costs of the new system would run about $4 to $5 million, compared to $20 to $30 million per mile for subways.

Rubber Division, CIC, Meeting Attracts Record Attendance

The Division of Rubber Chemistry of the Chemical Institute of Canada held a most successful technical conference at the Walper Hotel, Kitchener, Ont., Canada, on April 8, with a record attendance of 170 members and guests present. A symposium on "New Polymers" was featured at the morning technical session, and the mayor of Kitchener, H. E. Wambold, extended a welcome at the Rubber Division luncheon.

The Ontario Rubber Group held a dinner-meeting on the evening of April 8 at which L. E. Spencer, president of Goodyear Tire & Rubber Co. of Canada, Ltd., spoke on "Rubber—Sixties—Very Promising." This program was preceded by a suppliers' cocktail party.

Division Business Meeting

J. L. Macdonald, E. I. du Pont de Nemours & Co. of Canada, Ltd., chairman of the CIC Rubber Division, presided at the business meeting at the beginning of the morning technical session, assisted by D. Hay, Polymer Corp., Ltd., Division secretary-treasurer.

Mr. Hay gave a report on the finances of the Division, with mention of the return received from the publication, "Course in Rubber Technology," prepared in 1959, which was sponsored jointly by the Rubber Division, CIC, and the Ontario Rubber Group.

The report of the nominating committee headed by J. A. Carr, Dunlop Canada, Ltd., was presented by H. K. Cunliffe, also of Dunlop Canada, and a member of this committee, together with O. R. Huggenberger, Dominion Rubber Co., Ltd. The officers and directors nominated and elected were as follows: chairman, Alex Jaychuk, Goodyear of Canada; vice chairman, Mr. Hay, secretary-treasurer, Carl M. Croakman, Columbian Carbon (Canada), Ltd.; directors, Wray Cline, Canadian General Tower; W. J. Nichol, Dunlop Canada, and A. H. Holden, Canada Chemical & Colours, Ltd.

"New Polymers" Symposium

R. R. Tartaglia, B. F. Goodrich Canada, Ltd., chairman of the Ontario Rubber Group, presided at the morning technical session on "New Polymers."

"Advances in Silicone Rubber Polymers and Compounding," by C. W. Roush, Dow Corning Corp., Midland, Mich., was the first paper on the program. The paper was presented by A. M. Dunlop, Dow Corning Silicones, Ltd. It was pointed out that silicone rubbers do not have so good mechanical properties as other elastomers; however, these properties are retained over a wide temperature range from —185 to +600° F., because of the semi-inorganic nature of the siloxane molecule.

A simple polydimethylsiloxane can be prepared with improved low-temperature resistance by incorporating phenyl groups into the molecule and for better compression set by introducing vinyl groups in the molecule. Improvement in solvent resistance can be obtained by the introduction of the trifluoropropyl group into the polydimethylsiloxane molecule.

Silicone rubbers are vulcanized by organic peroxides through a free radical mechanism. Only inorganic fillers, such as silicas, metallic oxides, and silicates, can be used with silicone rubbers. Additives may be used to further improve compression set and heat stability.

The variety of gum stocks and compounded silicone rubbers made available to the rubber industry since 1954 were shown together with the improvements in physical properties that have been achieved. The effect of adding certain reinforcing and semi-reinforcing fillers to a typical base stock was shown.

A number of examples of practical stocks that could be prepared from base gum stocks for Navy cable insulation, oven door seals, roll coverings, aircraft seals, and automotive shaft oil seals were given.

"Polyurethane Elastomers," by M. Borr, Dominion Rubber research laboratories, Guelph, Ont., explained that polyurethane elastomers have been receiving an increasing amount of attention in the rubber industry recently, and the number of successful applica-

Speakers at Rubber Division Conference: *(top row)* M. Borr, W. H. Watson, A. D. Dingle; *(bottom row)* C. C. McCabe, T. A. Riehl, A. M. Dunlop, A. I. Medalia, J. Payne

tions is growing steadily. The development, chemistry, processing, properties, and applications of polyurethane elastomers were discussed.

Polyurethane elastomers may be prepared by reaction of a diisocyanate with a linear, hydroxyl-terminated polyester and polyether to form a polymer which is then chain extended and cross-linked to the finished elastomer. Non-cellular elastomers may be divided into two main groups: (1) millable gums, and (2) liquid polymers.

The solid gums may be cured with excess polyisocyanate, sulfur, or peroxide and can be processed on conventional rubber equipment. Thermoplastic polyester-urethane elastomers are available also which can be used in the unvulcanized condition and which display many of the desirable characteristics of the cross-linked polymers.

Polyurethane elastomers with vulcanizate properties comparable to those obtained from the gum polymers are available in liquid form, and processing of these liquid polymers does not require heavy equipment and lends itself to a high degree of automation. Casting, molding, spraying, spreading, and dipping techniques may be used in production. Cure is effected with a variety of active hydrogen compounds, such as polyamines or polyols.

Polyurethane elastomers are extremely versatile materials since by changes in chemical composition, molecular weight, curing system, additives, and reaction conditions, urethane vulcanizates can be obtained with a wide range of physical properties, varying from very soft rubbery compounds to hard plastic materials, Dr. Borr said. Among the outstanding properties exhibited by these elastomers are high strength and elasticity, high load-bearing capacity, hardness, resistance to abrasion, tear, fuels, oils, oxygen, and ozone. These properties were illustrated by reference to the Vibrathane polyurethane elastomers produced by Naugatuck Chemical. Proper design is very important in achieving optimum properties in a product made from polyurethane elastomers.

The commercialization of urethane elastomers is still in an early stage, and a great deal of work is being done both in the development of new elastomers with improved characteristics and in the development of new applications. Because of their unique advantages, the urethane elastomers are expected to assume a growing importance in the rubber industry, it was said.

"The Dynamic Mechanical Properties of Some New Elastomers," by A. D. Dingle, of the Dunlop research center, Toronto, was the third paper on the morning program. The properties of power loss (hysteresis), resilience, and modulus were determined for several new elastomers in comparison with natural rubber and SBR as a continuous function of temperature from —40 to 150° C., under conditions of constant load (20 kg./cm. 2) and a 10% strain. The new elastomers considered were *cis*-polybutadiene at *cis* levels of 95, 85, and 73%; *cis*-polyisoprene at approximately 90% *cis;* and ethylene-propylene copolymers at 50/-50, 60/40, and 70/30 ratios of ethylene to propylene. Butyl rubber of unsaturation up to approximately 4%, and Adiprene C as an example of polyurethane were also examined. All formulations were of the tire tread type.

The results show that *cis*-polybutadiene at the 95% *cis* level is equivalent to natural rubber in power loss and resilience with a higher modulus; whereas *cis*-polyisoprene is equivalent to NR in all three properties. Polybutadiene of lower *cis* content gave progressively poorer values for power loss, resilience, and modulus. As an example, resilience values for several polymers at 50° C. were as follows NR, 70; 95% *cis*-polybutadiene, 72; 85% *cis*-polybutadiene, 62; 73% *cis*-polybutadiene, 58; and SBR, 60. The ethylene-propylene copolymers have properties similar to those of SBR, but with a transition in the 40-60° C. range due to polyethylene blocks; this phenomenon may limit their usage in dynamic applications with the present systems available for cross-linking, which systems are thought to give improper cross-link distributions, Mr. Dingle said.

Butyl rubbers of higher unsaturation gave slightly improved properties when compared to those for such rubbers of lower unsaturation. The polyurethane had high abrasion resistance, but reverted at 135° C., which is considered to be a disadvantage for use in truck tires.

The 95% *cis*-polybutadiene and polyisoprene appear to be equivalent to NR in dynamic mechanical properties, and these elastomers can be considered as replacements for NR in full or in part, it was said. Processing difficulties with these new elastomers, however, will probably restrict usage to blends.

For tire use, ethylene-propylene copolymers are similar to SBR; while butyl and polyurethane elastomers appear to be of use for special type of tires.

"Improved Synthetic Rubbers for the Modern Tire," by T. A. Riehl, Goodyear Tire & Rubber Co., Akron, O., was the final paper on the morning program. Violent price fluctuations for natural rubber, new basic raw materials, critical shortages of certain elastomers, and the eminent introduction of improved and new elastomers present today's rubber industry with exciting times and challenges, it was said.

Exploding demands for rubber products throughout the world plus inadequate stocks of natural rubber have contributed to a critical situation which the United States and Canada have recognized by building up their synthetic rubber production facilities. The rest of the world is now actively engaged in increasing its synthetic rubber capacity, and by the later years of this decade synthetic rubber will account for 60% of the world's use of new rubber, Mr. Riehl predicted.

Since we are reaching a point where increased use of SBR in the larger-size tires is not practical, the new synthetic *cis*-polyisoprenes and polybutadienes are becoming increasingly important for blending with NR. Physical properties for synthetic *cis*-polyisoprene HAF black-reinforced truck tire treads were compared with similar NR stocks, and although the tensile, resilience, and tread wear were somewhat lower for the synthetic rubber treads, the synthetic polyisoprene could be used today as a 25 to 50% replacement for natural rubber, the speaker said. Availability of synthetic polyisoprene in quantity at a price not too far different from that of SBR is anticipated.

Although the processing of *cis*-polybutadiene presents difficulties, and present indications are that it will be more expensive than SBR, the polybutadiene is an excellent extender for NR and will improve the performance of treads now in use on truck tires.

Butyl tires offer certain improvements in tire performance, and it is possible to design a tire with the ultimate tread life of a conventional SBR tread. The factory problem involved in processing two incompatible materials, butyl and natural rubbers, is difficult, but not insurmountable. Butyl rubber at the present time appears pointed for use in a premium tire, and the ultimate future of the butyl tire will be entirely up to the buying public.

Neoprene is important for use in white sidewall compounds and in black sidewall compounds for premium tires as well as for a NR replacement in conjunction with SBR in truck tire treads. Neoprene can be used advantageously as a replacement for NR in liners for tubeless truck tires. Generally, the high price of neoprene has restricted its use to premium tire use as has also been the case with chlorosulfonated polyethylene, a companion elastomer.

Ethylene-propylene copolymers are being investigated for tire use and appear to have properties equal to or slightly better than those of SBR, together with the possibility of low cost. Evaluation has had to be on a limited scale because only small amounts have been produced in the United States, and it is not considered that this elastomer would be much of a factor in the rubber market until 1965.

Vinyl pyridine rubbers and polyurethanes have also been investigated for tire use. Although tires made of the former elastomer have been sold commercially, there is no great interest

Head table at Division luncheon: *left to right* H. H. Hencher, H. L. Blachford Ltd.; C. A. Croakman; A. Jaychuk; H. E. Wambold, Mayor of Kitchener; J. L. Macdonald; W. R. Cline; O. R. Huggenberger; D. Hay; R. R. Tartaglia. D. W. Emerson, editor, *Chemistry in Canada*, and D. G. Seymour were also seated at the head table, but are unfortunately not shown in this photograph

in this type of material at present. Polyurethane provides excellent tread wear and strength, but is difficult to handle on tire building machines. Owing to the high price and inherent stiffness of this material, little interest is being shown for pneumatic tires at the present time although solid tires are being produced and sold commercially.

The chemist who first finds a way to use these new rubbers to advantage in his product will not only get a jump on his competition, but will also perform a definite service to the rubber industry, this speaker concluded.

Afternoon Session

O. R. Huggenberger, Dominion Rubber, chairman of the Quebec Rubber & Plastic Group, presided at the Division's afternoon technical session.

"Rheological Measurements on Elastomers with the Brabender Plastograph," by C. C. McCabe, from Du Pont's elastomer chemicals department at Wilmington, Del., was the first paper of this session. It was pointed out, first, that rheological properties of elastomers are of primary importance during processing and must be maintained within certain limits for successful operation. The need of new and improved characterization tests is therefore clearly apparent. The inadequacy of single point characterization typical of widely used tests was emphasized.

The shear stress *vs.* shear rate relation appears most effective in characterizing elastomers, and since wide variations of these parameters exist in processing equipment, it is necessary to determine this relation over a wide range if processability is to be predicted. Shear stress *vs.* shear rate for neoprene, SBR, natural rubber, and butyl rubber were shown.

The Brabender plastograph affords a means of measuring rheological characteristics as a function of shear rate and temperature in either uncompounded and compounded stocks. Typical results for selected elastomers obtained under various operating conditions were discussed and compared to data obtained from other testing instruments and processing equipment. In addition to rheological characteristics, measurements of moisture content and scorch rate are easily obtainable, it was said.

The results of the determinations with respect to molecular theories of flow for viscoelastic polymers were interpreted in this paper.

"Determination of the Dispersion of Carbon Black in Rubber," by A. I. Medalia, Godfrey L. Cabot, Inc., Cambridge, Mass., described both light and electron microscope procedures for measuring the dispersion of carbon black in rubber. Primary aggregates of carbon black particles are those in which individual particles are permanently joined by sharing a crystal face; while secondary aggregates are simply a loose association of primary aggregates held together by attractive forces on the surface of the black. The size of primary aggregates is referred to loosely as "structure." The tendency of carbon black to form secondary aggregates is the basis for the process of pelletizing.

Disaggregation is the process of breaking down secondary aggregates and wetting and completely surrounding each particle by rubber. Measurement of the extent of disaggregation is accomplished by the Cabot laboratories by a modification of a method developed by the Dunlop Company in England and consists of sectioning of frozen rubber with a microtome followed by microscopic examination at 80 X (magnifications) by transmitted light. Dispersion ratings are calculated by determining the percentage of black present in aggregates larger than 6½ microns and substracting this percentage from 100%. Ratings above 98% are classed as good; 95%-98% as reasonable, 90%-95% as fair; and below 90% as poor.

When the black is dispersed more finely than can be distinguished at 80X, either high-power light microscopy or electron microscopy may be used. Oil immersion light microscopy provides 1000X, and photomicrographs of aggregates 20 by 30 microns and agglomerates in the 1-6½ microns range were shown. A photomicrograph of rubber in which the black was well dispersed showed light and dark areas of clouds which have been identified as bound rubber or carbon gel.

Electron micrographs of a low loading (30 phr.) of black indicate well dispersed primary aggregates; while at a 50 phr. loading there are dark regions containing clusters of black aggregates and light regions containing no black.

Dr. Medalia concluded his paper by stating that future work on dispersion at Cabot will include a broader study of aggregates smaller than 6½ microns, a more detailed study of the black clouds found in the 1000X photomicrographs, and the development of the technique of sectioning for the electron microscope to the point where ultrathin sections of uniform thickness can be cut from any stock.

"Antiozonant Blends and Their Testing," by J. Payne, Monsanto Chemicals, Ltd., London, England, discussed the development of a laboratory test for antiozonants based on stress relaxation measurements. He also described an outdoor test rig by which intermittent testing by means of samples in the form of small rubber belts were used.

In connection with the laboratory test, it was shown that for a given stock a peak value of stress decay is found on exposure of a stressed sample in ozone. In a normal tire sidewall compound this peak occurs at a strain of between 10 and 15%. Antiozonants affect this peak in two ways, as fol-

lows: (1) p-phenylene diamines shift the position of the peak to a higher strain and reduce the height of the peak to a certain extent; (2) substituted quinolines markedly reduce the peak height.

Work at the British Rubber Producers Research Association has shown also that these two types of antiozonants differ in their effect against ozone on a single cut test. In this work, p-phenylene diamine increased the critical stress needed for cut growth to occur; whereas the substituted quinolines reduced the rate of cut growth, but did not affect the critical stress.

Outdoor laboratory-type test rigs and tire tests have shown that mixtures of these two types of antiozonants, particularly N-phenyl N' isopropyl p-phenylene diamine (Santoflex P) and 6- ethoxy- 1,2- dihydro- 2,2,4- trimethyl quinoline (Santoflex AW) are more effective on a cost performance basis than either alone, and that the inclusion of a selected wax enhances the performance of the mixtures in outdoor tests, particularly in the intermittent dynamic test. Tire tests are still to be run on the three-way mixture.

It was postulated that optimum protection of SBR, particularly against ozone attack, can be achieved by the following measures: (1) preventing the ozone from contacting the rubber by the use of a selected wax; (2) increasing the critical stress for cut growth to occur by the use of p-phenylene diamines; (3) reducing the rate of cut growth by the use of substituted quinolines.

"Determination of the Physical Properties of a Five-Gram Sample of Rubber," by J. G. Briggs, W. H. Embree, E. G. Kent, and W. H. Watson, all of Polymer Corp., Ltd., was the final paper on the program. It was presented by Mr. Watson, who explained the use of a small two-roll mill, press, and micro dumbbell and ring specimens in the compounding and testing of the small amounts of synthetic rubbers produced in developing new polymers.

The mill consists of two rolls, one inch in diameter and 3½ inches long. Guides reduce the working length of the rolls to two inches, and both smooth and corrugated rolls were built. The rolls were individually driven and, when necessary, heated by suspending an infrared lamp over the rolls. An alternative method was to blow heated or room-temperature air (for cooling) on the mill rolls.

By employing variations in roll speed and separation of the rolls, it was found possible to get the same degree of breakdown on the micro mill as obtained on a 6- by 12-inch mill, using standard procedure. Curing was done in a hydraulic press with a wide range of platen temperatures, and for

Ashley & Crippen

Leland E. Spencer

most polymers there did not appear to be any great degree of influence on physical properties as the curing temperature was varied.

Micro dumbbells were died from sheets 2½- by 1½- by 0.03 inch thick, and ring samples 1.35 inches in outside diameter and 0.10 inch wide were molded in order to conserve the rubber compound. Specimens were tested on either the Instron tester or the Scott micro tensile testing apparatus.

A comparison was made between results obtained with micro dumbbells from full-scale laboratory compounds and micro compounds, and no significant difference in stress-strain values was found. Although some difference in tensile strength at break values were found with decreasing thickness of dumbbell specimens, modulus values were found to be independent of specimen thickness.

Tensile and elongation values for ring specimens are lower than for dumbbell specimens of the same stock; while the modulus for a ring is the same as for the dumbbell specimens. The reproducibility of test results for SBR compounds using the regular ASTM dumbbell, micro dumbbell, and the micro ring showed that the standard deviations were somehat poorer for micro testing, but where greater reliability is required, it can be achieved by replicate testing.

In addition to stress-strain testing, other types of test that have been developed on the micro scale include Mooney viscosity, hardness, low-temperature stiffening, torsional hysteresis, swelling in solvents and oils, flexing tests, etc.

Under development is a one-rotor internal mixer designed by the BRPRA and manufactured by Baker Perkins, Ltd. One of the features in this mixer is the degree of temperature control obtainable which is not possible with any other equipment of any size presently available, it was further said.

One of the real advantages of the micro compounding and testing technique is that it makes possible to screen out unsatisfactory polymers at the small bottle polymerization stage and thus save much time in expensive pilot-plant polymerization work. It is possible also to develop mixing procedures applicable to larger-scale mixing equipment based on the experience obtained on the micro mill rolls, it was said.

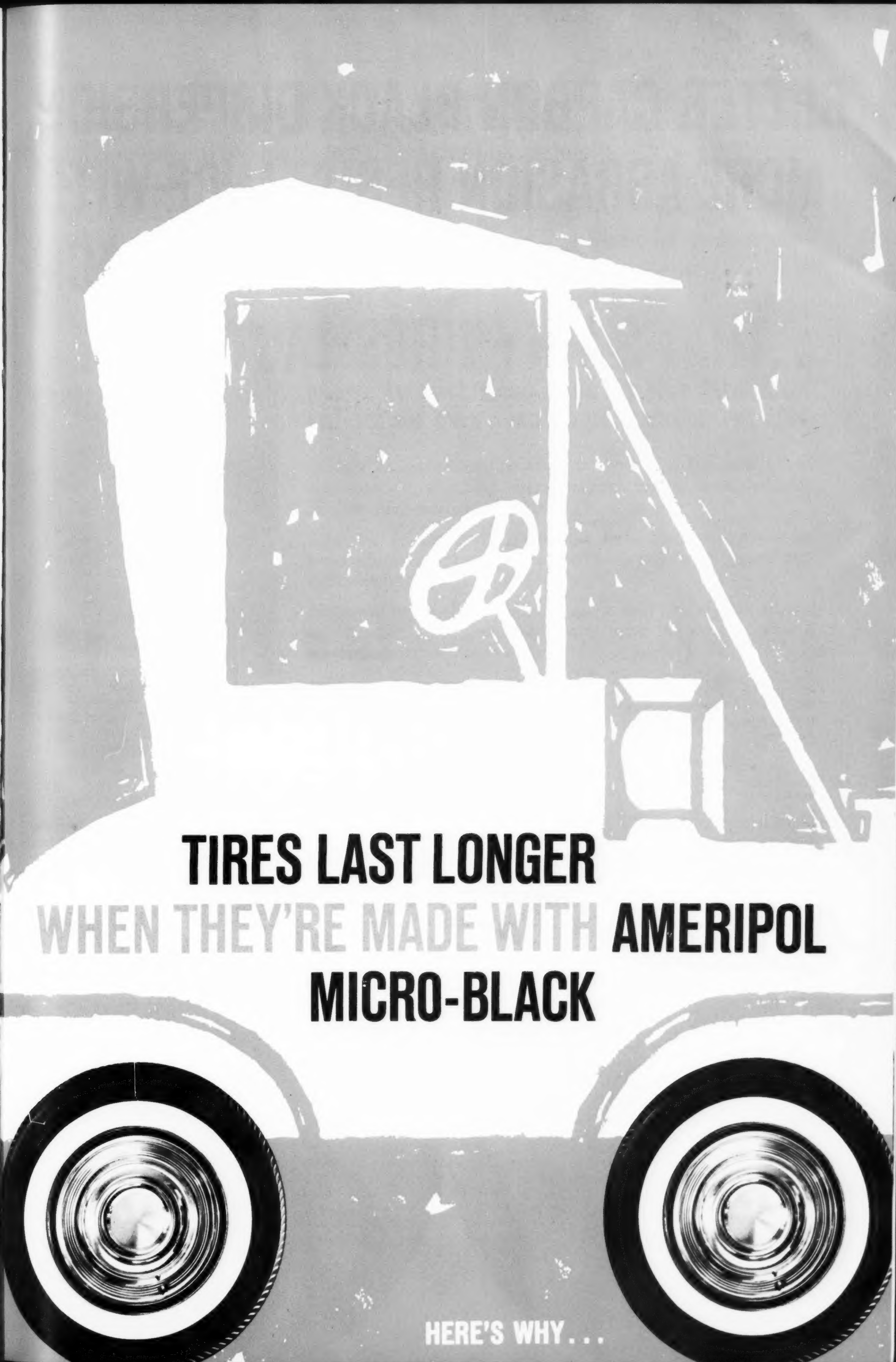
Ontario Group Dinner

The dinner-meeting of the Ontario Rubber Group was held at the Walper Hotel in Kitchener on the evening of April 8 in conjunction with the Rubber Division conference, with nearly 200 members and guests present. The Group chairman, R. R. Tartaglia presided. Head-table guests, in addition to Leland E. Spencer, the speaker for the evening, included R. V. Yohe, president, B. F. Goodrich Canada, Ltd.; H. Mason, president, Seiberling Rubber Co. of Canada, Ltd.; R. MacMillan, technical superintendent, Goodyear of Canada, who introduced Mr. Spencer; and officers and directors of the Rubber Division.

Mr. Croakman, chairman of the Group's nominating committee, presented a slate of new officers and directors, as follows: chairman, D. G. Seymour, Cabot Carbon of Canada, Ltd.; vice chairman, W. R. Smith, Dominion Rubber; secretary, L. V. Lomas, Lomas Chemical Co.; treasurer, B. B. Williams, Feather Industries, Ltd. For members of the executive committee, the following were named: C. Fletcher, Dominion Rubber, Kitchener area representative; B. Austin, Firestone Tire & Rubber Co. of Canada, Ltd., Hamilton area representative; M. Parrent, General Tire & Rubber Co. of Canada, Ltd., Welland area representative; and D. Hay, Polymer Corp., representative-at-large. W. R. Hogg, Naugatuck Chemical Division, Dominion Rubber, was nominated as chairman of the membership committee, and F. Capstick, Dunlop Canada, Ltd., as chairman of the entertainment committee. All were elected unanimously.

Mr. Tartaglia announced that the usual May international meeting of the Ontario and Buffalo Rubber groups would not be held because of the Rubber Division, ACS, meeting in Buffalo early in May, but that the international meeting may be held in October of this year.

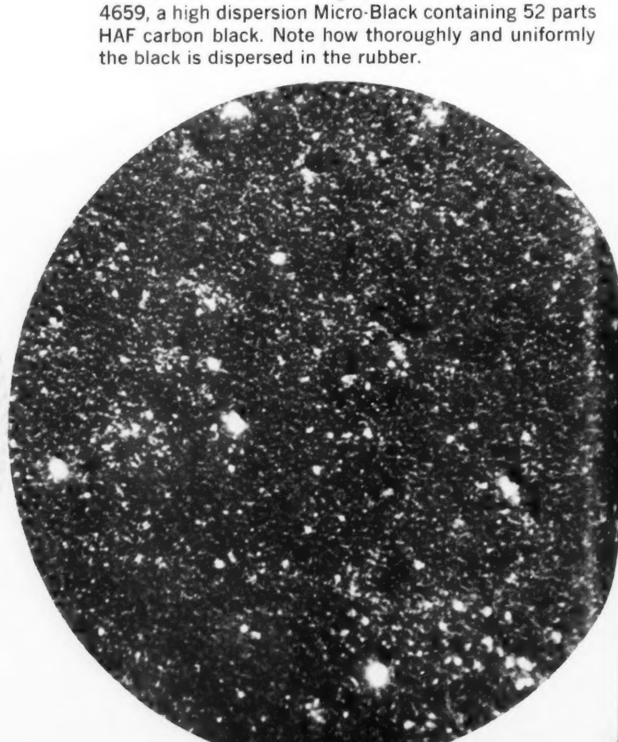
Mr. Spencer in his talk, "R.S.V.P!—Rubber — Sixties — Very Promising," said that the future of the rubber industry in Canada looked very promising for the present decade and cited certain statistics regarding the country as a whole to support his contention. Economic growth in Canada in the Sixties is estimated at 3-4% annually


TIRES LAST LONGER
WHEN THEY'RE MADE WITH AMERIPOL
MICRO-BLACK
HERE'S WHY...

BETTER CARBON BLACK DISPERSION, MORE ABRASION RESISTANCE WITH AMERIPOL MICRO-BLACK

...THAT'S WHY TIRES LAST LONGER

Illustration 1—Photomicrograph below shows Ameripol 4659, a high dispersion Micro-Black containing 52 parts HAF carbon black. Note how thoroughly and uniformly the black is dispersed in the rubber.



Compare the uniformity of carbon black dispersion in Micro-Black (illustration 1, extreme left) with a counterpart formula, dry-mixed (illustration 2) and a slurry-mixed black masterbatch (illustration 3).

Micro-Black's micron-size particles are thoroughly dispersed in the rubber by an exclusive process—high liquid shear agitation at the latex stage. Result: tires and other products made with Micro-Black have controlled uniformity, superior dispersion, and greater abrasion resistance.

Photomicrographs shown here were made by Dr. Raymond P. Allen of Akron, Ohio, well-known Consultant in Industrial Microscopy. They are certified to be exactly as shown (100 times magnification) and unretouched.

CHOOSE AMERIPOL MICRO-BLACK FOR YOUR RECIPES AND YOU GET NOT ONLY A BETTER END PRODUCT, BUT ALSO:

Savings in time—Since the black is already in the rubber, you eliminate one weighing operation, one mixing operation, and shorten other mixing operations.

Savings in equipment—Elimination of the carbon mixing operation frees equipment for other uses and makes possible increased production without additional investment.

Savings in power—Fewer mixing operations, plus shorter mixing cycles, mean lower power consumption for the same volume of production.

Savings in inventory costs—You purchase and handle only one material—Micro-Black—instead of two—rubber and carbon black. And you need no extra storage space for carbon black, since it's already in the rubber.

Illustration 2—A conventional dry mix masterbatch containing 52 parts HAF carbon black.

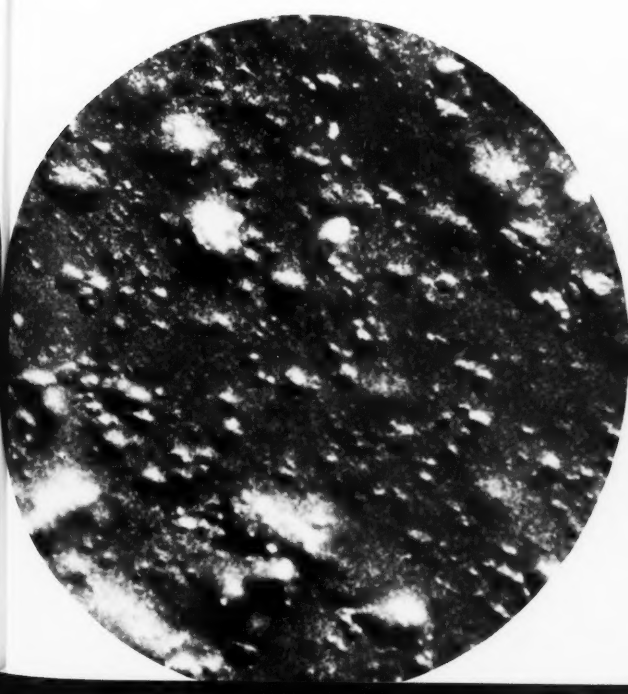
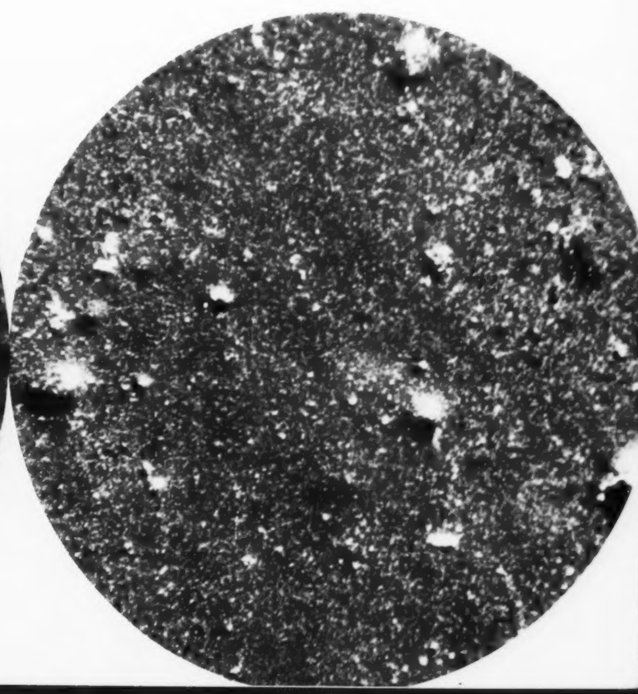


Illustration 3—A black masterbatch containing 52 parts HAF carbon black, mixed by competitive slurry method.



and accumulatively and would add up to about 140% of today's general level of business activity by 1970, when Canadian population should reach 21½ million, a rise of 20%, and the Gross National Production should advance from the 1959 figure of $35 billion to more than $50 billion. By 1970, Canada will have moved substantially away from its earlier status as a supplier of agricultural products and raw material sources and become much more of a manufacturer of finished goods.

One of the best barometers of standards of living throughout the world is the consumption of rubber per capita, and figures for North America, Europe, and the underdeveloped nations of the world were mentioned to make the point that a slight increase in the per capita consumption of rubber in the underdeveloped nations would mean a real strain on the supply of new rubber. Most of the needed new rubber will, of necessity, be synthetic, and the necessary expansions of synthetic rubber production throughout the world are being made, however, in advance of the expected demand. Other raw materials used in the manufacture of rubber products are in adequate supply and are constantly being expanded and improved.

Mr. Spencer said the motor vehicle population in Canada will increase from 5.2 million in 1960 to 6.5 million in 1965 and 7.8 million in 1970. He urged a speedup in the highway program in Canada even if this involved borrowing against the future in order that the future generations will both enjoy and pay for it.

Keen competition is expected in the rubber industry in the present decade, and a major problem is the necessity of selling against imports from mass-production and/or low-wage countries. The long-range remedy for this latter situation is to build up Canada's population and thus provide an enlarged market which would enable the rubber industry in Canada to function at cost/price levels prevailing elsewhere.

The whole human race wants to get on wheels, and the nation most on wheels is the most prosperous nation. As the transition to wheels occurs, GNP rises, increased incomes accrue to those engaged in producing the additional goods and services. Production, consumption, and employment rise together, and businessmen will have to keep on their toes to adjust their operations to the expanding and changing needs of the increasing population, it was added.

Mr. Spencer said in conclusion that he felt his estimate of the growth of the Canadian economy in the present decade was conservative, and that he expects the rubber industry in Canada to grow at least 50% in this period.

F. Ron Gorrie, Cabot Carbon of Canada, Ltd., thanked Mr. Spencer for his talk at the end of the meeting.

Gordon Research Polymer And Elastomer Conferences

The Gordon Research Conferences for 1960 will be held from June 13 to September 2 at Colby Junior College, New London; New Hampton School, New Hampton; and Kimball Union Academy, Meriden, all in New Hampshire.

These Conferences were established to stimulate research in research foundations, universities, and industrial laboratories. The Conferences consist of informal-type group meetings with scheduled lectures and discussion groups. The conference for a particular branch of research runs for a week from Monday to Friday. Requests for attendance or other information should be addressed to the Conference Director, W. George Parks, University of Rhode Island, Kingston, R. I.

Two conferences of major interest to readers of RUBBER WORLD are the sessions on elastomers to be held the week of June 20-24 and the polymer conference to be held the week of July 4-8. Both of these sessions will take place at Colby Junior College.

R. L. Zapp (Enjay) will serve as chairman of the Elastomers Conference; while Gerard Kraus (Phillips) will be vice chairman.

The programs of these conferences follow.

Elastomers Conference

June 20. **"The Chemistry of Halogenated Butyl**—Preparation and Reactions," by F. P. Baldwin and I. Kuntz, Esso Research & Engineering Co., Linden, N. J.; **"Chlorinated and Chlorosulfonated Polyolefins,"** P. J. Canterino and G. R. Kahle, Phillips Petroleum Co., Bartlesville, Okla.; **"Present Status of the Chemistry of Vulcanization of Natural Rubber,"** C. G. Moore, British Rubber Producers' Research Association, Welwyn Garden City, Herts, England.

June 21. **"Behavior of Elastomers under Rapid Deformation,"** F. J. McGary, Massachusetts Institute of Technology, Cambridge, Mass.; **"Elastomer Dynamics,"** M. Berger, Esso Research; **"Rolling Friction of Elastomers,"** A. M. Bueche and D. G. Flom, General Electric Co., Schenectady, N. Y,

June 22. **"The Butyl Lithium Initiated Polymerization of 1,3-Butadiene,"** I. Kuntz and Arthur Gerber, Esso Research; **"Influence of Organic Side Groups on the Rheological Properties of Polysiloxanes,"** K. E. Polmanteer, Dow Corning Corp., Midland, Mich.; **"The Rheology of Filler Loaded Rubber Vulcanizates,"** A. R. Payne, Research Association of the British Rubber Manufacturers, Shrewbury, Shropshire, England.

June 23. **"Influence of Extension on the Electrical Anisotropy of Elastomer —Carbon Blacks Compounds."** René Chasset, Institut Français du Caoutchouc, Paris, France; **"Internal Rotations of Polymer Molecules in Response to Mechanical Stresses as Indicated by Birefringence Measurements,"** R. W. Andrews, MIT; **"Mechanism of Ozone Cracking,"** G. Salomon, Central Laboratory TNO, Delft, Netherlands.

June 24. **"The Vulcanization of Fluorocarbon Elastomers,"** J. F. Smith and G. T. Perkins, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Polymer Conference

July 4. **"Recent Advances in Polymer Chemistry,"** H. Mark, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.; **"New Polymers and Copolymers of α-Olefins,"** C. G. Overberger, Polytechnic Institute of Brooklyn; **"Relation of Structure to Properties in Urethanes,"** E. F. Cluff, Du Pont.

July 5. **"Present Status of the Chemistry of Vulcaniaztion of Natural Rubber,"** C. G. Moore, BRPRA; **"The Kinetics of Sulfur-Decrease in Accelerated and Unaccelerated Vulcanization of Natural Rubber and Synthetic Rubbers,"** W. Scheele, The Rubber Institute at the Technische Hochschule, Hannover, Germany; the discussion leader is David Craig, B. F. Goodrich Co., Brecksville, O.

July 6. **"Transition Phenomena in Polyethylene Terephthalate; Infrared, X-Ray and Nuclear Magnetic Resonance Studies,"** I. M. Ward, Imperial Chemical Industries, Welwyn Garden City; **"Comparison of Experimental Results Regarding the Physical Behavior of Polyethylene,"** K. Wolf, Badische Anilin & Soda-Fabrik Ag, Ludwigshafen-Rhein, Germany; **"Calorimetric Measurements with High Polymers, Especially the Detection of Irreversible Reactions,"** F. H. Müller, University of Marburg, Marburg, Germany; the discussion leader is R. Buchdahl, Monsanto Chemical Co., St. Louis, Mo.

July 7. **"Expansion of Copolymerization Theory** (Influence of Neighboring Units on Radical Reactivity with Monomers)," G. E. Ham, Spencer Chemical Co., Kansas City, Mo.; **"Homogeneous Anionic Polymerization,"** M. Morton, University of Akron, Akron, O.; **"Polymerization by Oxidative Coupling,"** A. S. Hay, G-E.

July 8. **"Some Novel Observations on Polymerization in Solution,"** G. M. Burnett, University of Aberdeen, Aberdeen, Scotland.

Cross-Linked Polyethylene Featured at NYRG Spring Meeting

The New York Rubber Group held its spring meeting at the Henry Hudson Hotel, New York, N. Y., on March 25. The afternoon technical program consisted of a symposium on "Cross-Linked Polyethylene," which was followed by a cocktail hour and then dinner in the evening. E. S. Kern, R. T. Vanderbilt Co., 1960 chairman of the Group, presided at the afternoon session and at dinner. More than 300 were present at the afternoon symposium, and about 175 stayed for dinner.

It was announced that the NYRG would hold its first dinner-dance on May 20 at the Hotel Roosevelt in New York and would include a cocktail reception as well as dinner and dancing. The cost will be $25 per couple and will include favors for the ladies.

At dinner Chairman Kern introduced those present at the head table and then announced the availability of space on charter flights to Europe this summer being sponsored by the Society of Plastics Engineers. One of these flights in October will enable participants to attend the meeting of the German Rubber Society in West Berlin, the International Synthetic Rubber Conference of *Rubber and Plastics Age* in London, and a plastics show in Dusseldorf, Germany. The Rubber Division of the American Chemical Society, at its meeting in Buffalo, N. Y., in early May, will consider a separate charter flight for Division members for these October meetings.

Mr. Kern then turned the dinner-meeting over to M. E. Lerner, *Rubber Age*, secretary-treasurer of the Group, who made some further comments on the arrangements for the dinner-dance and the charter flights to Europe. He then distributed several door prizes including a stereo-high fidelity record player.

The participants in the symposium on "Cross-Linked Polyethylene" were R. Urban, Union Carbide Plastics Co., division of Union Carbide Corp.; B. C. Carlson, R. T. Vanderbilt Co.; and Gerard W. Kuckro, General Electric Co.

"Polyolefins—Beginnings and Future," by R. Urban, Union Carbide Plastics Co., division of Union Carbide Corp., Bound Brook, N. J., reviewed, first, the early history of polyolefins beginning with the discovery of polyethylene by chemists at Imperial Chemical Industries in England in 1935 and the subsequent use for submarine cable insulation and for radar during World War II.

In the post World War II period, polyethylene found extensive use not only in the wire and cable industry, but in the film and molding industries and, more recently, in the blow molding and film extrusion coating industries. Consumption of polyethylene in the United States alone amounted to one billion pounds in 1959.

The first polyethylene was made by a high-pressure process, but a low-pressure process was developed which provided a higher-density material with a substantially unbranched molecular structure frequently referred to as linear polyethylene.

The degree of crystallinity or lack of branching can generally be correlated with polymer density; the higher the degree of crystallinity or lack of branching, the higher the density. Melt index is a logarithmic measure of average molecular weight for a given resin type, and low values indicate high molecular weight. Many other physical properties were explained in some detail with reference to the values desired for certain types of applications.

The grades of polyethylene used for various applications were outlined in terms of melt indices and densities as follows: For film, melt indices from 0.6 to 6.0, densities from 0.914 to 0.960 are used, with the largest volume of use concentrated in the 0.916 to 0.936 range; for film extrusion coating, melt indices from 3 to 12, densities from 0.914 to 0.960, with the bulk still below 0.930. High-quality pipe products are based on resins of 0.2 to 2.0 melt index and 0.918 to 0.945 densities, with a recent trend toward lower melt index (higher average molecular weight) and medium-density resins. Wire and cable use resins with 0.1 to 2.0 melt index and densities from 0.914 to 0.930, in order to obtain products with good crack resistance.

For injection molding the trend has been toward high-density materials with melt indices from 2 to 30, with a considerable portion in the 10 to 30 range. Wall thickness can often be reduced with high-density products while maintaining stiffness. For blow molding, a melt index range of about 0.1 to 2.0 has been general, and the density range was, until recently, well confined to the 0.914 to 0.930 range. The availability of good stress cracking performance in high-density products has made possible a greatly expanded use of 0.945 to 0.965 density products in the detergent bottle market, it was said.

Since a considerable capacity for the production of polypropylene will soon be available, some comment on properties and possible applications was made. With a specific gravity of 0.90-0.91, polypropylene is among the lightest plastics available, and its rigidity in thin walls, good properties to 300° F., abrasion resistance, electrical properties, and clarity were cited as advantages. Its present poor low-temperature brittleness and susceptibility to breakdown at greater than 75° C. in the presence of copper, even though stabilized, were mentioned as disadvantages. Applications might be for pipe fittings, packaging films and containers, heat sterilizable containers and other household articles, and wire and cable insulation.

Mr. Urban concluded with brief mention of a period of growth being experienced at the present time through the development of new polymers and copolymers in the polyolefins complex in which copolymers in particular show great promise in modifying and improving properties and creating new property combinations.

"The Compounding of Cross-Linked Polyethylene" was described next by B. C. Carlson, R. T. Vanderbilt Co., New York, N. Y. It was first pointed out that although polyethylene cannot be cured by the conventional sulfur-accelerator systems, the use of certain peroxides provides a means of converting a thermoplastic resin into a thermoset material by methods which are not materially different from those used in compounding rubbers. As a result, a new engineering composition with a wide range of properties, in most cases superior to those of the thermoplastic form, may be developed. The low-density polyethylenes have the lowest crystallization temperature and are most readily adapted to processing in rubber equipment.

It was shown how polyethylenes of high melt index are safer processing than those of low melt index at the samel level of peroxide, but that better tensile strength and impact resistance are obtained by use of low melt index resins.

Using the Vanderbilt peroxide called Varox (a 50% mixture of di-t-butyl peroxy dimethyl hexane and an inert carrier), the effect on the stress-strain curve with changes in Varox content under constant cure conditions of time and temperature for a basic compound containing 50 parts of medium thermal black and 0.60-of a part of AgeRite Resin D per 100 parts of a low density resin was shown.

A convenient method used to determine relative state of cure is a modification of the Williams plasticity procedure, and variations in cure time and Varox content were used to show how this method relates properties of polyethylene to the degree of cross-linking. Data were also provided to illustrate the relation of tensile strength, elongation, abrasion resistance, and low-temperature brittle point to state of cure for various loadings of MT black. Calcium carbonate fillers may also be used, but the physical property levels obtained are generally lower than those with the MT black.

The use of the proper type and amount of antioxidant and the use of

plasticizers with cross-linked polyethylene compounds were also discussed.

In processing, temperature control is essential during mixing, and the range of 250-275° F. is preferred in internal mixers. On the two-roll mill, a mill surface temperature of 200-220° F. is desirable, it was said. In extruding, machines with a relatively high length to diameter ratio are preferred, with temperature settings in the various zones of the barrel depending on the temperature control equipment used, type of loading in the stock, and rate of extrusion.

Open steam curing in CV equipment has been used in wire insulation applications, and several continuous methods of curing pipe are being considered, including high-pressure open steam, molten metal, and electrical induction heating.

The production of molded cured products is in an early state of development. In some cases the mold must be cured in order to obtain an undistorted product; while in other cases, where a high state of cure and high filler loadings are used, the product may be removed from a hot mold without undue distortion.

This speaker concluded his talk with examples of compounds for rigid pipes and conduits, mechanical goods, and blown sponge. In the last case, both open- and closed-cell sponge has been made, and the molding and forming techniques are very similar to those used in the rubber industry.

"Cross-Linked Polyethylene in the Wire Industry," by G. W. Kuckro, General Electric Co., Bridgeport, Conn., was the third and final paper of the symposium. Experiments done about 10 years ago by a well-known polyethylene producer in adding fillers to polyethylene were first described, and then the work of A. R. Gilbert and F. M. Precopio, of General Electric, which resulted in the development of filled polyethylene cross-linked by peroxide or Vulkene[1] was explained.

The extrusion of Vulkene on to wire and the CV process for curing were described and illustrated. Elimination of the Banbury mixer and replacement with a vented extruder are in the process of development, it was said. Preblended powders would be fed into the throat of the extruder, and at a distance two-thirds from the throat all volatiles would be drawn off by vacuum through an opening in the barrel. The compound could then be used for insulating wire at the head of the extruder; it could be pelletized for future CV curing; or it could be formed into a pipe or conduit by dry heat.

Many slides were shown to demonstrate the characteristics of the original black compounds. Information on properties such as electrical stability, abrasion resistance, low-temperature flexibility, chemical resistance, tensile strength and elongation, etc. were included, some of which had been previously published.[1] Other new information on chemical resistance, effect of antioxidants and colorants was also presented.

This speaker reviewed the patent situation on cross-linked polyethylene stating that British patent No. 597,833, issued in the middle 1940's, described the use of organic peroxides added to polyethylene and heated above 40° C., but that this was not practical since available peroxides decomposed below the milling temperature of the polyethylene. Then British patent No. 619,905 (1949) used a solvent to dissolve the peroxide and immersed the polyethylene into this solution; then the solvent was evaporated, and the absorbed curing agent heated to effect cross-linking. In 1951, Du Pont was granted British patent No. 659,958 for cross-linking polyethylene with di-tertiary alkyl peroxides having higher molecular weights and higher decomposition temperatures.

The first U. S. patent, No. 2,826,570, was issued March 11, 1958, to the Hercules Powder Co. (Ivett) and is directed broadly to polyethylene cross-linked with dicumyl peroxide and several other peroxides. The next patent of interest was No. 2,888,424, issued May 26, 1959, to Gilbert and Precopio to General Electric Co. and is directed to peroxide cross-linked polyethylene containing silica, carbon black, alumina, or calcium silicate as a filler, a multi-component system as compared with the Ivett two-component system patent. The Ivett patent is presently in interference in the Patent Office with another General Electric application (filed five days before the Ivett patent).

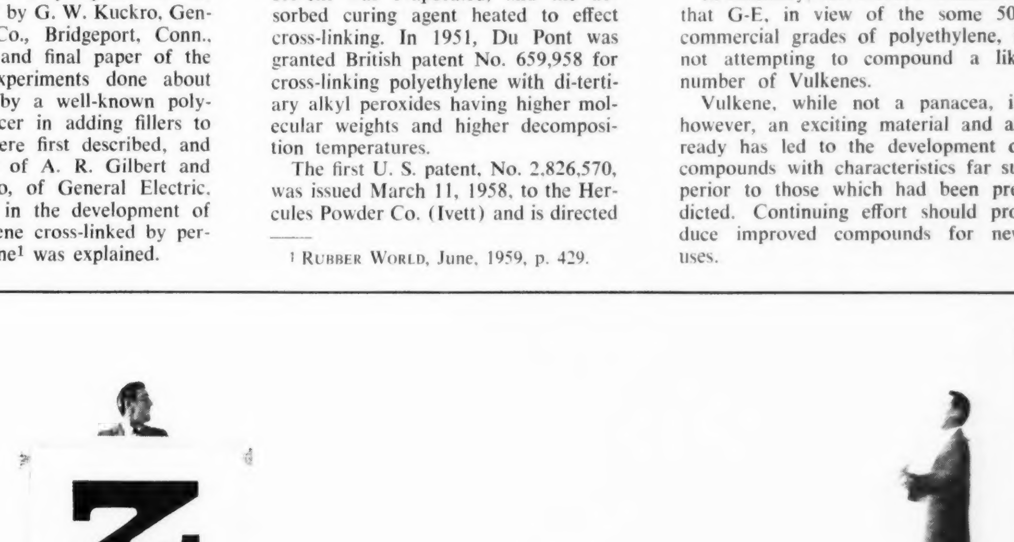
In order to resolve the interference, General Electric and Hercules have entered into an agreement whereby General Electric has the right to license the Hercules patent in the filler-containing field covered by the Gilbert and Precopio patent. Hercules has the right to grant sublicenses outside of the filler-containing field regardless of who prevails in the current interference. The agreement with Hercules provides that each party will grant licenses on reasonable terms within its respective fields. General Electric is proposing to license compounders of chemically cross-linked, filled polyethylene on the basis of a royalty of 1¢ for each percentage of active peroxide contained in the compound.

Another U. S. patent, No. 2,930,083, was issued to Bailey and Vostovich, of General Electric, on March 29, 1959, and covers open steam curing, use of guanidine and open steam curing, and use of pregelled polyethylene and open steam curing.

In summary, Mr. Kuckro commented that G-E, in view of the some 500 commercial grades of polyethylene, is not attempting to compound a like number of Vulkenes.

Vulkene, while not a panacea, is, however, an exciting material and already has led to the development of compounds with characteristics far superior to those which had been predicted. Continuing effort should produce improved compounds for new uses.

[1] Rubber World, June, 1959, p. 429.



Polymer and Dispersion Symposia At Southern RG Houston Meeting

New Polymer panel included *(left to right)* Quentin Trahan, moderator, Win C. Smith, and F. W. Hannsgen

Information on some of the newer polymers and advice on the ever-present problems of dispersion were featured in two symposia held by the Southern Rubber Group during its meeting February 12 and 13 at the Shamrock Hilton Hotel, Houston Tex. In addition to the two technical sessions, a banquet was held Friday evening.

The first technical session on Friday afternoon was titled "New Polymers" and was moderated by Quenton Trahan, Firestone Tire & Rubber Co., Lake Charles, La. First speaker at this session was F. W. Hannsgen, Jr., Shell Chemical Corp., Torrance, Calif., who delivered a talk on "Properties of Shell Isoprene Rubber and Its Vulcanizates." Second speaker on polymers was Win C. Smith, Enjay Co., Linden, N. J., with a paper on "Advancing Technology in Butyls."

The Saturday morning technical program featured three talks on "Dispersion of Pigments and Chemicals" with Ross C. Whitmore, Better Monkey Grip, Dallas, Tex., as moderator. Leading the speakers of this session was I. Drogin, United Carbon Co., New York, N. Y., who covered "Incorporation and Dispersion of Ingredients in Rubber." Next speaker was A. I. Medalia, Godfrey L. Cabot Inc., Boston, Mass., with a method for the "Measurement of Dispersion of Ingredients in Rubber." The final speaker at this session was Carl P. Mullen, The Gates Rubber Co., Denver, Colo., who discussed the "Significance of Dispersion of Ingredients in Rubber."

The Friday evening banquet was directed by the group chairman, Eldon H. Ruch, Firestone, assisted by Frank Steitz, J. M. Huber Corp., Houston, as master of ceremonies. Speaker for the banquet was Rev. W. P. Deatherage, rector of the First Christian Church of Houston.

Speakers on dispersion were *(left to right)* Ross C. Whitmore, moderator, I. Drogin, A. I. Medalia, and Carl P. Mullen

New Polymers

A description of properties and the manufacturing status of Shell Isoprene Rubber were covered in the talk by Mr. Hannsgen. He noted that production of this isoprene rubber began in commercial-scale equipment last spring, and that a large plant is now being constructed. Developments of the synthetic rubber industry were reviewed briefly. Besides, a short analysis was given of the economic and supply and demand relations as a basis for explaining the current activity in the field of isotactic polymers.

The physical properties and handling characteristics of polyisoprene were outlined. In general, processing and compounding procedures are similar to those of natural rubber. Certain simple variations, depending upon the type of stock being made and the equipment being used, help achieve optimum properties. The effects of various reinforcing blacks have been studied, as have accelerator levels and types in order to aid the user on obtaining the best overall balance of properties.

The discussion on butyl technology was divided into two major sections. The first part of the talk dealt with recent work with new cure combinations and the development of the new chlorobutyl, MD-551, and the latter part of the talk covered butyl rubber latex.

The first cure system discussed was that of the sulfur donor. No elemental sulfur is used. Sulfur is supplied through morpholine disulfide, thiuram tetrasulfides, or dibutyl xanthogen disulfides. In dealing with the effects on physical properties, the speaker stated that tensile strength was lowered slightly, elongation increased somewhat, and compression set improved over conventional cure.

Another cure system investigated was the resin cure. A comparison was made of a stannous chloride-activated resin cure and a bromo resin cure that contains its own activation. The bromo resin cure excells in two major characteristics. It is not corrosive and is not scorchy; while the stannous chloride activation is scorchy and corrosive. Typical formulas along with several tables of physical test results were given for both of the above cure systems.

Current techniques in the use of the chlorobutyl polymer were also shown including tables with considerable general data on the heat resistance and the compatibility of this polymer with other elastomers.

Data were shown on quite a number of applications that have been proved in field tests using chlorobutyl alone or in blends with other polymers. Most of these application data include typical formulas as well as pertinent physical test information. Applications include inner liners for tubeless tires, white sidewall compounds, curing bladders, steam hose, conveyor belting, jar seals and gaskets, valve diaphragms, and a spark-plug cap.

The use of butyl rubber latex was

discussed for non-transport applications. Butyl latex was developed to facilitate manufacture of the all-butyl tire and was used in tire cord adhesives; however, the latex is also used in its own right for it makes butyl rubber available in latex form. The latex, designated MD-600-55, is an anionically emulsified latex of Enjay Butyl 268. It is a very stable latex with unusual tolerance for pigments and ionic materials. Deposited films can be cured in boiling water and display the typical properties of butyl rubber. Typical applications include paper coatings, nonwoven fabrics, and adhesives.

Dispersion of Materials

In his talk on dispersion, Dr. Drogin covered the subject from all angles including reasons for the existence of dispersion problems, the various materials involved and their part in the problem, and some of the methods and procedures used to minimize or eliminate dispersion problems. The speaker pointed out that dispersion is a relative problem depending upon the product being made. In mats, for instance, dispersion is not a factor, while in tires good dispersion is deemed essential, and in certain industrial rubber products such as engraving gums, rubber covered rolls, aircraft parts, and weather stripping a higher degree of dispersion than even that of tires is necessary to meet desired standards.

The paper included a section on every normal type of compounding ingredient with pertinent properties and data on each. A comparison was made of the various physical forms of the ingredients such as liquid, particle size of powders, or solids. The mixing methods and processing steps specified in light of their effect on dispersion.

The second speaker on dispersion, Dr. Medalia, covered a method for measuring and evaluating dispersion. [This paper was also presented before the Rubber Division of the Chemical Institute of Canada and is abstracted in the write-up of that meeting which precedes this section in this issue—EDITOR.]

The final speaker on dispersion, Mr. Mullen, considered the problem with regard to its significance on properties and final performance of the part. He covered the effect of dispersion on such use properties as tread wear, cut resistance of white sidewalls, V-belt life, and extrusions. The utilization of reclaims in extrusion was discussed with regard to good dispersion and the effect on die swell and surface looks. In conclusion, the speaker stated that it can not be overemphasized that dispersion is essential to provide abrasion resistance, flex life, weathering, and product appearance. He said that the ultimate properties and product requirements must be balanced, however, against product manufacturing economics.

Surface Preparation Key to Good Bonding

The April meeting of the Elastomer & Plastics Group, Northeastern Section, American Chemical Society, was held at Science Park, Charles River Dam, Boston, Mass., April 19, with 55 attending a cocktail hour, then a meeting and dinner.

The speaker of the evening, introduced by the chairman of the Group, James H. Fitzgerald, Harwick Standard Chemical Co., was Stewart L. Brams, Dayton Chemical Products Laboratories, Inc., whose topic was "Bonding of Metals to Elastomers."

Mr. Brams first discussed the cleanliness of surfaces as the most important single factor in the problem, emphasizing the preparation of metal surfaces. Physical cleaning methods produce the best surface, he reported, in particular, small-grain grit blasting which produces abraded surfaces, as opposed to peened surfaces which are often obtained where large grit particles are used for too long a period. Such blasted surfaces, i.e., peened surfaces, although appearing abraded, are not clean. An alternative method is grinding, which produces good surfaces by removing oxidation and impurities. Detergent cleaning in conjunction with ultrasonic treatment also is better than simple chemical treatment.

Chemical methods of cleaning were not generally so effective as grit blasting, Brams went on, although iron plating can be used to obtain high-quality bonds. Detergent cleaning generally produces lower-quality bonds. Acid etching can be used with thin parts which cannot be blasted, but such treatment is dangerous and requires close attention. Phosphate surfacing is useful as it can be conveyorized, for cost reduction of quality treating; however, with this method, two coatings often are necessary where one blasting operation suffices. Copper plating, although still useful with natural rubber and SBR, is not so common as at one time.

Mr. Brams next dealt with laboratory methods of testing adhesives, covering the variables of molding, bonding agents, test conditions, metal and stock surface cleanness, composition of metal and stock, and nature of stresses involved. He described the ASTM tension and 90° strip tests, criticizing each in its limitations, and discussed the influence of test conditions on results, indicating where each was useful. His test results were obtained by the "hand cut and strip" method, in which the sample is half-cut and half-stripped from the metal surface under examination. The use of parts of the same size in production and in testing, he said, gives closer results to those secured in production, than do other methods.

The speaker also considered the recently reported work of Painter, in which results on 45° conical inserts were given. In Bram's opinion the metal surface sharpness is a critical factor in this test method. It produces a tension gradient in the sample, with the highest tension in the center.

A semi-dynamic distinction test also was discussed, in which three- by one-inch prepared metal strips were coated and vulcanized ⅛-inch apart with various elastomeric compositions. The strips were then drilled and tapped near the ends to accept standard bolts, which could be adjusted simply to give any desired degree of tension on the sample as the plates were forced apart. Various aging treatments could be applied to the samples in this condition. Brams proposed this method as one to replace dumbbells for studying stress.

A case study was discussed in which six stocks and six cements were cured in this type of apparatus. The samples were examined for the effect of prebaking on the primers, for the degree of cement flow during curing, the percentage stock failure of the sample in the "hand cut and strip" method, and the tendency of the compound to stain the surface of an untreated surface in the double or sandwich-type metal plate form. This particular study showed primer flow could be controlled by prebaking, that formulations had to be very clean, and that best adhesion requires matching of cement and stock.

"Rubbers in Missiles" Is Panel Topic at NCRG

"Rubber Problems in the Missile Race" was the topic for a panel discussion at the regular March 10 meeting of the Northern California Rubber Group at the Elk's Club, Berkeley, Calif. Ross E. Morris, civilian director of the Mare Island Naval Shipyard Rubber Laboratory, acted as moderator, and Eugene Tomlinson, Aerojet-General Corp., and James Gaughan, Lockheed Missile and Space Division, as panel members. Introductory talks by panel members were followed by a question-and-answer session.

NCRG officers and panel members at head table include *(left to right)*: vice president, K. Large, Oliver Tire & Rubber Co.; J. Gaughan, panelist; R. E. Morris, moderator; E. Tomlinson, panelist; and president, B. W. Fuller, E. I. du Pont de Nemours & Co., Inc.

Mr. Gaughan spoke on the need of the rubber and missile industries to become better acquainted with each other. The missile industry, although highly informed in such fields as metallurgy, ceramics, electronics, astronautics, plastics, etc., is basically unaware of rubber as an essential engineering material. Unfortunately, rubber is often considered as a single chemical material of unvariable qualities. The missile industry is usually guilty of supplying such an incomplete environmental and usage background to rubber people as to make proper compound selection impossible. Contrary to public opinion, this stems from language, understanding, and technological barriers, not usually from the classified information barrier.

In turn, Gaughan said, there is much about the missile industry that is not apparent to the rubber industry. Liquid propelled missiles raise a whole new family of fuel compatibility problems lacking a foundation of existing data. In contrast, solid propelled missiles offer new opportunities to utilize the non-oil-resistant polymers. There are two special requirements for rubbers in missile use, five-year storage and higher reliability during that time. In addition, some peculiarities of supplying the missile industry with rubber were pointed out: (1) exceptionally short delivery times, involving small quantities, favoring the small, flexible, local supplier; (2) quality and performance of the parts override the usual stringent economics of the rubber industry; (3) production, other than certain prototype, is to military or other defined specifications with formal quality control requirements; and (4) liaison with newly formed missile divisions may involve contact with more people than would be commonly encountered.

Mr. Tomlinson discussed the use of rubber with liquid rocket engines. In particular, obtaining elastomeric seals for use with fuels and oxidizers is one of the greatest problems at hand. In describing the development of storable liquid rocket propellants by the Liquid Rocket plant of Aerojet-General, Tomlinson pointed out many difficulties associated with the proposed fuel, a 50:50 blend of UDMH:N_2H_4 called Aerozine 50, and with the oxidizer, N_2O_4.

With Aerozine 50, neoprene and butyl rubber appear to be suitable as seals if properly compounded. Nitrile rubber exhibits post-immersion shrinkage. Silicones become soft in four-hour immersion and stiffen in the air after immersion. "Viton," Fluorel, and Kel-F elastomers are chemically attacked and decompose. Aging properties of elastomers are important, since long-term storage of the system is involved.

The oxidizer presents even greater elastomer problems. The N_2O_4 is more destructive than red fuming nitric acid. For example, standard Kel-F 5500 compounds decompose within four hours. All the non-fluorinated polymers, with the exception of butyl and Hydropol, have shown no resistance to N_2O_4. Of the fluorinated polymers, only "Viton" and Fluorel show promise, and these by special compounding, reported Tomlinson.

Tomlinson concluded with the statement that Aerojet-General is open to suggestions and is willing to cooperate with the rubber industry to reach a successful conclusion.

Ross Morris, the moderator of the ensuing panel discussion, described some of his own research and development work in missiles at the Mare Island Naval Shipyard. The Polaris, a submarine missile, must be stored in a vertical tube within the submarine. An item called an adapter or "shoe" was designed to support this missile and to isolate it from damaging shock waves. At the time of actual firing, the adapter is required to slide off the tube with the missile and have enough buoyancy to float away from it after ejection. The problem of shock migration was solved through the use of reclaimed butyl, an elastomer of very low resilience. A Teflon surface chemically attached to the rubber article provided the low coefficient of friction to satisfy the necessity for sliding. Buoyancy was attained by proper engineering design.

Mr. Morris then acted as moderator for the panel discussion which followed. Some questions had previously been submitted by the members of the group in advance of the meeting, and other questions were directed from the floor. A question of prime interest to rubber suppliers concerned the nature of samples to be submitted for tests of stability toward N_2O_4 in the liquid missile system. Mr. Tomlinson

stated that preliminary tests would be performed on four quarter-sized samples cut from slab. Encouraging results from these tests would then require additional samples of larger size, for which suitable reimbursement would be made. Although the polymer itself must be specified, in no way would the manufacturer or supplier be required to provide formulation of proprietary compounds.

Although overall national volume of elastomer needs could not be divulged, it was stated in response to query as to total market potential, that a premium price would be paid for each component. The nature of the time scale in determining thermal stability is particularly accentuated in missile applications. Some elastomers may withstand several thousand degrees Fahrenheit in the few seconds required, although they may not withstand much lower temperatures over longer periods of time.

Mr. Morris stated, in summary, that this field is one of custom manufacture, rather than mass production, in which rubber requirements themselves may vary greatly. Many of these problems at present are only partially solved. The key to acceptance of elastomers in missile applications appears at the present to be the development of new elastomers, rather than new compounding techniques, with the exception of butyl rubber cured with phenolic resins.

TLARGI Foundation Technical Conference

The first annual conference of The Los Angeles Rubber Group, Inc., will be held June 1-2 at the Mayfair Hotel, Los Angeles, Calif., consisting of two technical sessions, the first on the afternoon of June 1, and the second on the morning of June 2.

The following nine papers, selected from 30 most outstanding papers presented before the International Rubber Conference in Washington, D. C., last November, will be presented:

"The Rotomill, A Continuous Mixing Device." Arthur E. Juve, B. F. Goodrich Research Center, and R. H. Kline, National Rubber Machinery Co.

"Silicone Rubber — Today and Tomorrow." P. C. Servais and K. E. Polmantier, Dow Corning Corp.

"World-Wide Developments in Tire Production." C. A. Litzler, C. A. Litzler Co.

"A Towing Device for Estimating Road Wear." L. P. Gelinas and E. B. Storey, Polymer Corp., Ltd.

"Latex Masterbatching, Compounding Developments, Future Possibilities, and Influence on Rubber Manufacture." Isaac Drogin, United Carbon Co.

"A Practical Method of Classifying All Elastomeric Vulcanizates." N. L. Catton, E. I. du Pont de Nemours & Co., Inc.; R. C. Edwards, Chrysler Engineering; and T. M. Loring, Precision Molded Co.

"Contrast in Response of Elastomers to High-Temperature Vulcanization." F. B. Smith, Naugatuck Chemical Division of United States Rubber Co.

"Compounding *Cis*-Polyisobutadiene." H. E. Railsback, C. C. Biard, and J. R. Haws, Phillips Petroleum Co.

"*Cis*-Trans Isomerization in Natural Polyisoprenes." J. I. Cunneen, British Rubber Producers Research Association. (Paper will be presented by Ralph F. Wolf, Natural Rubber Bureau.)

A $5.00 fee will admit registrants to both sessions and supply each registrant with a reprint or preprint of each paper presented. There will be no formal cocktail parties, luncheons, or banquets.

Selection of future papers for the technical conferences will be made from those presented before the immediately preceding meetings of the Division of Rubber Chemistry of the American Chemical Society.

Elastomers Course

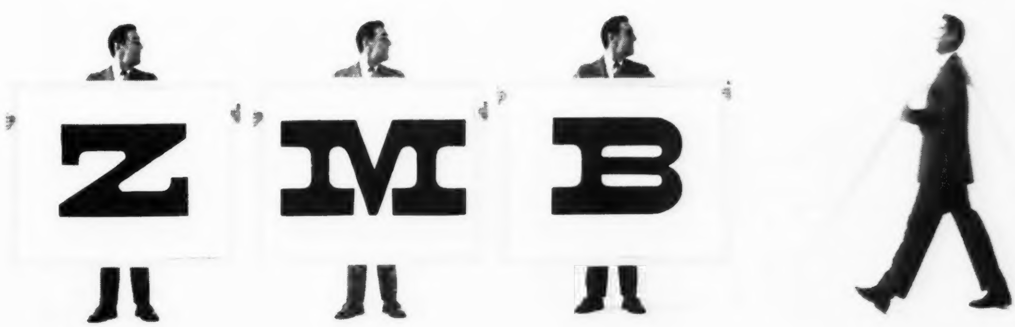
The Institute of Rubber Research, University of Akron, Akron, O., has announced the fifth annual course on the Chemistry and Physics of Elastomers for scientists and engineers to be held in Knight Hall on the University campus. This one-week intensive course, June 13-17, 1960, consists of morning lectures (9:00 a.m. to noon), afternoon laboratory sessions (1:30 to 4:30), and afternoon lectures (4:30 to 6:30).

The course director will be Maurice Morton, director of the Institute of Rubber Research, and he will be assisted by the University staff augmented by outstanding scientists from the industry.

Kelly-Springfield Toured by WRG

Some 30 members and guests of the Washington Rubber Group, Washington, D. C., went on a plant tour of The Kelly-Springfield Tire Co.'s tire manufacturing facilities at Cumberland, Md., April 20. The tire firm, a wholly owned subsidiary of The Goodyear Tire & Rubber Co., was luncheon host for the entire group preceding the actual afternoon guided plant tour.

Kelly-Springfield personnel were on hand throughout the tour to answer all questions and to demonstrate and explain the operation of tire manufacturing. Operations witnessed included compounding, tire-cord tensioning and ply preparation, tread extrusion, tire building, both Bag-O-Matic and bag-type vulcanization, and finishing and inspection operations. The manufacture of various lines of quality truck and passenger car tires made by Kelly-Springfield proved quite interesting to the guests and afforded an opportunity to see the intricacies of this multiphased operation.



WASHINGTON REPORT

By JOHN F. KING

New Stockpile Disposal Law Details Revealed in House

The great secret of how the government plans to dispose of natural rubber from the national stockpile over the next few years has finally been pried out of the Office of Civil & Defense Mobilization and the General Services Administration, the two agencies handling the sales program.

The prying was done by the House Armed Services Committee, and more particularly by Rep. Porter Hardy (Dem., Va.), one of the more alert members of the House. He forced publication of interagency letters detailing the disposal plan on March 30, when the House was passing the Administration's bill to permit the sale of about 470,000 tons of stockpiled natural rubber on the open market. The Senate has not yet acted on the measure but undoubtedly will before Congress adjourns.

Sales Plan Details

Very briefly, the government's secret plan basically involves the terms under which sales will be made, featuring a graduated scale of prices and quantities to be sold. The sale "yardstick" will permit the government to sell an unlimited amount of rubber in any quarter where the market price is 36¢ a pound and higher. When the price is between 34-36¢, 27,000 long tons may be sold in any quarter; when it is between 32-34¢, the quarterly limitation is 18,000 tons; between 30-32¢, the quarterly limitation is 9,000 tons. When the price falls below 30¢ no sales may be made.

Now that the agencies' detailed disposal plans are in the public domain, a lot of people are wondering why they were regarded as so sensitive as to be kept secret in the first place. A lot more people, including Representative Hardy, are wondering whether, in fact, they were kept secret. OCDM's director who has policy responsibility for stockpile management, Leo A. Hoegh, sent the quantity-price scale to GSA Chief Franklin Floete on October 30, 1959. It is no secret that scores of government officials were acquainted with Hoegh's letter months ago, which raises the question of who outside the government might have been made privy to the plan. Secrets have a way of leaking out when more than one person knows them.

Administration Criticized

The secrecy policy brought the agencies under not only pressure for more information from the trade, but strong criticism, particularly during consideration by the Armed Services Committee of the Administration disposal plan. Various excuses were advanced for keeping the operating details of stockpile sales "classified," but usually Administration apologists fell back on the argument that to make public its full disposal plan would "upset the market."

To which Representative Hardy exploded on the House floor that "everyone realizes that nothing can disrupt a market operation more effectively than an atmosphere of uncertainty . . . And when we consider the size of the operation proposed by (the Administration) in the sale of natural rubber we can readily understand that a wide effect on the market could result."

Hardy noted that OCDM deputy Chief Roy Price had invoked the market as the reason for not divulging the sale plan during committee hearings on the bill, and retorted that "I submit that its secrecy could be more disruptive than full knowledge of the plan."

For the record, the market has never fallen below 36¢—the top price on the OCDM-GSA scale—since disposal was started last October 16. During the life of the sale program, an estimated 62,000 tons had been sold as of April 15. The official figure as of the period October 16-April 1 is 57,629 long tons sold in lieu of rotation.

Further Details

A few other details of the sales program made public during the March 30 House debate show that in laying down policy, OCDM told GSA to do what it can to sell "at even, monthly rates" under the quantity-price scale—that is, to keep sales, depending on price, at 3,000, 6,000, and 9,000 long tons a month. Hoegh's October 30 letter to Floete directed that when prices are in the 30-32¢ range, "if you are unable to make any disposals in the first two months of any quarter, the limit for the third month will be 6,000 long tons." Hoegh added that "sales shall be made for delivery within the current month or the three succeeding calendar months" and that "in the event any seriously deteriorated rubber is in the stockpile, it may be sold without restriction."

The sixth-month-old, classified letter also let it be known that the sales program is subject to change to keep it flexible and thus able to meet changing market situations. It pointed out that the views of the trade will be considered in the event modification of the program is needed. The government will keep in touch with the trade through the Interagency Advisory Committee on the Disposal of Natural Rubber, which has functioned for years to keep the Defense Materials Service of GSA posted with the latest situation in the industry. The Advisory Committee, according to the letter, can recommend changes in quantity and price arrangements "as circumstances warrant."

It is believed that the disposal of the estimated 470,000 tons from the total stock estimated at 1.2 million tons will take several years, at least through 1965, when world shortages of natural rubber are expected to continue. The "several years" timetable apparently falls short of the original nine-year disposal plan the Administration worked up last fall. At that time it was thought that disposals at an annual rate of 40,000 to 50,000 tons would take nine years, but now the duration of the program is never mentioned. The first year's experience with the sales effort will probably move some 85,000 tons into consumption instead of the original target of 40,000 to 50,000 tons.

By doing a little guessing, the Administration figures it will turn a net profit of about $30 million in the total 470,000-ton selling program. This represents the appreciation of value be-

tween the prices paid to acquire the rubber for the prices received at sale, plus storage savings. Overall, the sell-off will return more than $400 million to the Treasury.

From the industry's point of view, however, the sales program represents something much more important than the liquidation of stocks for cash. A known, freely available source of natural rubber will be a boon in the years immediately ahead when supplies will be at least as tight as they have been in the last year or so.

Wagmight Coated-Fabric Missile Gets Review and Limited Study OK

The controversy over the so-called Wagmight missile-aircraft which surfaced in the Navy Department in February[1] popped up again in the House Appropriations Committee in April. The Committee on April 15 released a transcript of testimony between the two main figures in the Wagmight dispute, Captain Cooper B. Bright, Navy author of the project, and his boss, Vice Adm. John T. Hayward, Deputy Chief of Naval Operations for weapon development.

Deputy CNO Skeptical

The main point of the testimony before Rep. George Mahon's subcommittee was, as reported by Rubber World, that Captain Bright thinks the inflatable rubber, jet-powered combination missile-aircraft is a wonderful idea, but the boss, Admiral Hayward, still isn't convinced.

"I have 50 officers who can come up and give you ideas such as Wagmight," Hayward told Chairman Mahon, a Texas Democrat whose influence with the Pentagon is second to none in Congress. The Admiral explained that in addition to Wagmight, the Navy has project "Flat Fence," project "Tepee," and "we have 450 proposals from industry on how to find submarines."

The Deputy CNO for development made it clear that with a fixed budget and a heavy weapons development program, the Navy simply has to be "selective." The outspoken admiral said that being selective means "We cannot go into vast projects with half vast ideas." He continued, however, in a more conciliatory vein:

"I am certainly going to examine it (Wagmight) and I said I would, but I have any number besides the Wagmight that have fallen by the way. . . . Whether we would build an airplane with it is another question. We may use only part of it for structural material. We may do any number of things, but at the moment we are not going forward. It is not in the fiscal 1961 budget."

This last statement, while not holding out much hope for the Wagmight missile project itself, reiterates Hayward's earlier statements reportedly conceding that the neoprene-covered nylon fabric, which is a main component of the inflatable device, could have valuable uses for a number of other Navy projects.

Present Wagmight Status

Captain Bright had a little trouble getting his story told to the Subcommittee, according to the transcript of the closed-door hearings. He had to put into the record, without being allowed to read, a long statement of who he was, and what Project Wagmight was all about.

Bright claimed that Admiral Hayward in 1958, about the time Bright and a couple of Goodyear Aircraft Corp. engineers began working on the project as a Navy study, had written a letter which "backed" the study and suggested "going forward with its development immediately, using fiscal year 1959-60 funds." He also said that the Defense Department's Office of Research & Development, under Dr. Herbert York, had told him last summer that if the Navy "would come up with a requirement" for Wagmight, DOD would program $3 million for the project.

But because of technical difficulties — Admiral Hayward's main objection to Wagmight is that he believes it could not meet "packageability" specifications — "the thing has stayed on dead center" because Hayward's office would not issue a "requirement," Bright told the subcommittee.

"This objection has been set aside," Bright continued. "The technical people say now it can be folded with all the equipment in, that it is technically feasible to go ahead with the development program, and that we can realize a quantum jump in naval airpower if we bring Wagmight into the fleet."

The discussion continued at some length, but it did not change Hayward's mind. "I have no requirement for the Wagmight as it exists today," he pronounced.

As matters stood in mid-April, Hayward and the Navy are considering uses for the fabric and also a feasibility study of Wagmight, even though the Deputy CNO isn't convinced that Bright's idea will produce a Navy program to put a swarm of atomic-bomb-bearing Wagmights into its arsenal.

[1] Rubber World, Mar., 1960, p. 851.

New SR Export Outlook

While some foreign trade experts are holding their breath waiting for American exports of synthetic rubber to tumble into a long decline, a couple

signs on the horizon encourage other experts to believe that a boom in synthetic exports may be with us for some time to come.

Reasons for SR Exports

First, the most current figures on export performance show that synthetic shipments abroad are running nearly double what they were for a comparable period a year ago. More than 60,000 long tons were exported in the first two months of this year, compared to the 33,327 long tons exported in January and February of 1959. Exports for the whole year—which was a poor one for United States exports generally—totaled a healthy 289,843 long tons.

Second, Europe is heading into a period of economic activity that will overshadow the swift pace of industrial output throughout the Fifties. The experts believe the Old World, having accomplished complete rehabilitation from the war, will set about filling its immense internal demand for consumer goods in the decade ahead.

Third, a related development, the main European market in the next ten years—the so-called Common Market of France, West Germany, Italy, and the Benelux Union which comprises some 180 million souls—has decided to give tariff-free treatment to its imports of synthetic rubber from outside countries.

Duty-free status for the European Economic Community's synthetic rubber imports will be accomplished gradually over the next decade as the so-called common tariff of the Six is phased into effect. The zero-duty synthetic tariff may be speeded along, however, if the United States can negotiate an EEC tariff concession on synthetic at this fall's international negotiations being sponsored by the General Agreement on Tariffs and Trade (GATT).

G-List Includes SR

Word that synthetic imports into the six-nation Community will be free was passed along to the United States State Department recently in the form of the so-called G-list of commodities on which the Six had negotiated duties. The 70-odd items on the EEC G-list were the most "sensitive" imports of Western Europe—that is, the products on which the six member-states had conflicting interests as, for instance, where France would want a high rate of duty, but Germany a low tariff or none at all. Negotiation of rates for the listed commodities took nearly a year.

Duties on practically all other imports into the six-nation community have been set by arithmetically averaging out the individual rates of the six members. All the EEC "common external tariffs" will start taking effect next year and will become fully implemented through stages by 1970.

Other items on the G-list of interest to the rubber trade are butyl alcohol, which will have a 14% common tariff, and factice derived from oil, which will have a 10% tariff.

Taken together, these three developments might go a long way toward minimizing the drying up of American export outlets for synthetic rubber which is anticipated as more and more foreign capacity comes on stream. Six months ago Attorney General William P. Rogers in his annual report on competition within the American synthetic industry[1] suggested that U. S. synthetic producers will meet the same fate that has befallen the U. S. automobile industry, i.e., gradual disappearance of export markets. Rogers forecast that in addition to this, foreign production now rapidly coming on stream "eventually may affect the domestic market."

Supreme Court Rules Against O'Sullivan

The workers who struck the O'Sullivan Rubber Corp. plant in Winchester, Va., four years ago and who have carried on a consumer boycott of the company's products ever since won a somewhat hollow victory in an April 4 Supreme Court decision.

The long struggle between O'Sullivan and Local 511 of the United Rubber Workers Union[2] was ended when the High Court ruled that the union has a right to picket the company and continue its consumer boycott of O'Sullivan products.

The picketing and the boycott—which still go on in Winchester 24 hours a day—were ruled illegal by the National Labor Relations Board. The ruling was upheld by a U. S. Court of Appeals in Richmond, but URW appealed the case to the Supreme Court which gave the union victory, four years to the day from the start of the O'Sullivan strike.

This would have been a major decision for the union and organized labor as a whole two years ago. At that time, one of the great demands of Labor was for amendment of the Taft-Hartley law to permit a union which had lost a majority of an employer's workers still to have the right of peaceful picketing. This would have fit the needs of the 400 O'Sullivan strikers, who were replaced with non-union labor by O'Sullivan shortly after the walkout began, permitting the company to continue operations. NLRB and the Appeals Court ruled that Local 511 could not continue picketing and the boycott after determining the union did not represent O'Sullivan's workers.

The union argued that its decertification as bargaining agent for O'Sullivan's workers violated its right of free speech, but found a friendly audience only on the Supreme Court. NLRB and the Appeals Court based their adverse decisions on the Taft-Hartley Act's prohibition of non-representational picketing. Such picketing, however, was narrowly circumscribed by last year's Dandrum-Griffin labor reform law.

[1] See RUBBER WORLD, Nov. 1959, p. 256.
[2] *Ibid.*, June, 1958, p. 438.

FTC and Lee Rubber Tire Consent Decree

Lee Rubber & Tire Corp. has entered into a consent order preventing the firm from using misleading brand names on its tires, the Federal Trade Commission announced in April. FTC's action in effect represents the adoption of an order by Commission Hearing Examiner Harry R. Hinkes which had been agreed to both by the company and FTC's Bureau of Litigation.

FTC complained last September 24 that Lee's "Ultra-Deluxe" and "Advanced Super Deluxe" tires are not of equal quality—neither premium nor first line—as implied by the names themselves and advertising matter issued on the tires. FTC charged that the two types were premium and second-line tires, respectively. The Commission further charged that Lee lowered the quality of its "Advanced Super Deluxe" and "Regular Deluxe" tires without revealing this fact in its advertising.

The order agreed to by Lee and FTC specifies that Lee must not (1) represent that different quality tires are of the same quality, or (2) reduce the quality of its tires without changing the trade name, unless the quality reduction is clearly and conspicuously disclosed. The agreement is for settlement purposes only and does not constitute an admission by the company that it violated the Federal Trade Law.

"Viton" for O-Rings

The Parker Seal Co., Culver City, Calif., has developed a new "Viton" based O-ring compound, designated V500-6. The new compound is said to retain flexibility at temperatures below —100° F.

Functional tests indicate that the material performs with excellent results in all hydraulic fluids and oils in the high temperature range, 400 to 500° F. The temperature adaptability of V500-6 should make it an excellent substitute material to solve problems where tougher and more flexible compounds are required, reports the manufacturer.

INDUSTRY NEWS

Firestone Develops Three-Piece Tire Mold for Precision Tire

The Firestone Tire & Rubber Co., Akron, O., announced recently the development of a new three-piece tire mold, replacing the traditional two-piece mold and capable of producing tires of precision quality heretofore unattainable, while at the same time providing benefits to the tire manufacturer.

"For sixty years Firestone and the rest of the tire industry have manufactured tires in two-piece molds that part in the center of the tread," J. J. Robson, director of tire engineering and development for Firestone said. "Now Firestone will use a new type mold that at last enables the most important part, the tread, to be molded more accurately as a single unit. The result is an unbroken ring of tread design that produces virtually round tires.

"Of equal importance," Robson added, "is the fact that this mold allows complete freedom of tread design extending across the face of the tread. The center area of the tread is now completely tractionized, and this gives the consumer a safer, sure-footed tire by providing much improved grip on wet surfaces and on snow and ice."

The new three-piece mold does not lay claim to success by virtue of having three instead of two pieces. The true story is in the design of the mold.

Until now, every tire was made in a two-piece mold, with the two mold halves coming together at the center, as shown in Diagram I. As the rubber is molded into the shape of the two halves, some rubber flows into the mold separation line and leaves a ridge, or seam line, circumferentially around the tire tread, as shown in Diagram II.

Also, since the two mold halves come together at the center of the tread, any mismatching of halves brings resulting irregularities in the most important part of the tire, the tread area. It is true that the two halves are registered, but the register must, of necessity, be relatively loose. There can be mismatch radially in relation to the tread area; there can be mismatch circumferentially, where one half of the mold is rotated slightly in relation to the other. The tread pattern which is carefully designed for quietness and for smoothness of ride can be thrown out of balance, thus discounting all the careful design considerations.

Diagram III shows a sketch of the new three-piece mold, which eliminates all mismatch possibilities and the seam line. The two mold jaws and the tread and the backing rings are cast of aluminum. The tread ring, A, is cast in a relatively thin-section aluminum band, and the shrinking or distorting stresses are naturally less severe in this ring than in a heavy variable-section casting, as shown in Diagram IV, it was said. The tread ring is mounted in the backing ring to maintain perfect concentricity of the tread surface with the mold ring.

In secondary benefits to the tire manufacturer, the new mold design allows for cheaper, faster tread design changes and has adaptability to different types of curing equipment, thus preventing shutdowns while design changes are being made. The simpler tread casting of the new equipment permits experimental procedures heretofore not considered economically feasible, it was added.

The first tire to be built in the new mold will be the Firestone Nylon "500," a premium tire for high-speed turnpike driving. It will be available in 13-, 14-, and 15-inch rim sizes. Among the advantages claimed for tires made with the new mold are improved traction under all driving conditions, 35% improvement in tread wear, smoother operation and increased stability for easier car handling, and better durability at high turnpike speeds.

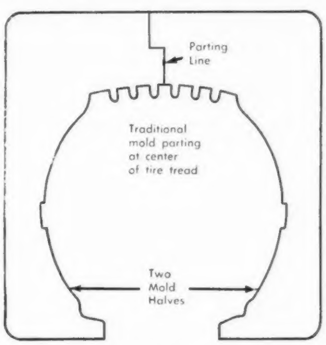


DIAGRAM I

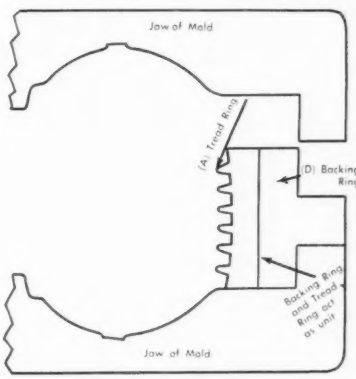


DIAGRAM III

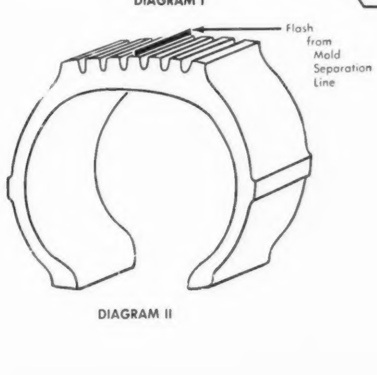


DIAGRAM II

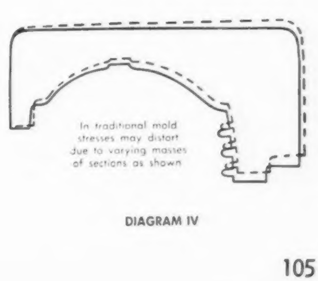


DIAGRAM IV

Year Extension For Neoprene by FDA

In the March 17, 1960, issue of *Federal Register*, a number of chemicals are listed for which the Food & Drug Administration has granted an extension of one year for compliance with the Food Additives Amendment. Neoprene is included in this list under two classifications, according to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. It is listed first, on page 2204, section 121.87(c), as neoprene latex for use in adhesives, and later on page 2205, section 121.87(d), under the elastomers section, designated 2-

chloro-1,3-butadiene (neoprene) with acceptable stabilizer and/or antioxidant for use in containers for food packaging.

Du Pont is in the process of collecting necessary extraction data for petitioning the FDA for an advisory opinion on food handling use of simple gum compounds of Neoprene Types W and GRT and Neoprene Latex Types 842A and 571. The company is limiting this work to the simple gum vulcanizates, owing to the impracticality of including the numerous compounding ingredients used throughout the rubber industry. Du Pont will continue to make known new information relative to the Food Additives Amendment as it relates to Du Pont products.

Arch Mease Retires After 43 Years

Arch J. Mease, manager of the western district (Los Angeles) office for the sale of dyes, chemicals, and elastomers of E. I. du Pont de Nemours & Co., Inc., retired at the end of April after a 43-year career.

Mr. Mease started at the Carrollville, Wis., plant of the Newport Chemical Co. (later acquired by Du Pont). He was transferred to Passaic, N. J., in 1920 and was made plant superintendent there in 1921. A year later he was named a dyestuff salesman in Newport's Chicago office and then was transferred to the Utica, N. Y., office in 1928.

When Du Pont acquired Newport in 1931, Mr. Mease became a dyes salesman in upper New York State. He was sent to the New York district in 1938 and in 1942 was named a sales correspondent in the rubber chemicals division (now the elastomer chemicals department) at Wilmington, Del.

Mr. Mease became assistant manager of the dyes and chemicals division of the organic chemicals department's Boston, Mass., office in 1943 and in 1946 was named manager of the San Francisco, Calif., office. He was transferred to the dyes and chemicals division's Los Angeles office in 1953 as district manager and in 1955 became district manager of the western district office, which is a district office for the elastomer chemicals department as well as the dyes and chemicals division of the organic chemicals department.

RMA Cites Hodgson For Retreading Work

J. W. "Bill" Hodgson, manager, treading and repair material sales, The Firestone Tire & Rubber Co., Akron, O., recently received a special award from The Rubber Manufacturers Association, Inc., at a meeting of the Retread & Repair Materials Committee of the Association at the Sheraton-Cleveland Hotel, Cleveland, O.

George Flint *(left)*, chairman of RMA's Retread & Repair Materials Committee, congratulates J. W. "Bill" Hodgson on his forthcoming retirement

A plaque was presented Mr. Hodgson in appreciation of his constructive contribution to the work of the committee during the past 33 years. The message read:

"As he retires after a business lifetime in the Rubber Manufacturing Industry, we cite his unselfish cooperation, breadth of vision, outstanding abilities and boundless energy which have contributed greatly to the industry's welfare, in peace and war."

Mr. Hodgson, often hailed as the dean of the American retreading industry, has been with Firestone 29 years. He plans to retire June 1.

Attending the meeting were managers of camelback and repair materials sales and their technical advisors from rubber company members of the RMA.

Goodyear Automates Literature Searching

A mechanized "information retrieval" system which will reduce to minutes the time required to find scientific literature is being initiated by The Goodyear Tire & Rubber Co., Akron, O., according to R. P. Dinsmore, vice president for research and development. Believed to be a rubber industry "first," the system is a major advance in the attempt to take advantage of the ever-increasing volume of technical literature and data available to research scientists.

In moving from manual searching to a speedier, more efficient mechanical system, Goodyear will employ an IBM 101 electronic statistical machine that makes a single function of sorting, accumulating, and printing the source of information contained on a card.

To find information on a subject, the operator need only set the dials of a panel board and push a button. In a matter of minutes, all cards indicating source documents are collated for the researcher. Cards will show the name of publication, with volume, page, year, title, and authors, in addition to essential subject matter information.

Goodyear anticipates a dictionary of 100,000 terms or more, and it will be possible to incorporate any 25 of them on one card, Dinsmore said. Subject and author files can be searched for as many as six variables in one pass of the cards at a rate of 450 cards per minute.

Miss Leora Straka, Goodyear research librarian, started development of the system several years ago and was assisted by F. K. Dietzler, data analyst on the Goodyear company's development staff.

Offers All Traction Tire in Nylon Cord

A new low-priced replacement on-and-off-the-highway tire for trucks, called the Firestone All Traction Nylon truck tire, has been announced by Earl B. Hathaway, vice president of sales, The Firestone Tire & Rubber Co., Akron, O. The tire, previously offered with a rayon cord body, now has the added strength of nylon cord, at a new low price.

The tire is said to be well suited for truckers hauling building materials, ready-mix concrete, oil, lumber, farm supplies, coal, and similar truck services where about 90% of hauling is on paved roads.

The tread is up to 61% deeper than that of regular truck tires, reports Firestone. This provides greater mileage as well as low cost-per-mile operation. The tire incorporates Firestone Rubber-X to insure longer tread wear as well as Firestone's S/F shock-fortified nylon cord body which resists damage from shock and impact.

Constructed of three continuous center ribs for smooth running on the highway, the new tire incorporates a tapered groove design which prevents retention of rocks between the ribs. The traction bars which are locked firmly to the shoulder and outer rib give added stability and extra traction in adverse conditions often found in off-the-highway service.

Recommended for rural haulers and local truck operators who need a combination highway and traction tire, the Firestone All Traction tire will be available in all popular sizes from 6:00-16 through 11:00-24.

A Trade Mark Is Born

Anyone who has taken part in the design, selection, and adoption of a new name or trade mark is well aware of the amount of effort, tearing of hair, and mental anguish that is devoted by those involved. In the case of United Carbon Co., New York, N. Y., the problem was more complicated than usual in that there were already 500 registered trade marks containing the word "United" and a search of the Manhattan (New York) telephone book turned up 1500 company names which contain "United" as a part of their corporate or business title.

In introducing the finally acceptable trade mark, R. W. French, company president, told the thirty-fifth annual stockholders' meeting that "A company has a reputation whether it wants one or not."

In explaining the reasons for the two-year search for the new design Mr. French said, "To better identify a firm and its activities, a hallmark or trade mark is increasingly helpful as a focal point. Such a symbol is particularly important when the products and markets are spreading to other places and countries and are changing through diversification. The new symbol was developed in order to establish and identify permanently a broader, deeper understanding of United Carbon both in this country and abroad."

The search for a symbol that would reflect the solidity, integrity, and the modern and international approach of the company was further restricted by the desire for a mark that would retain its identity and visual impact no matter what its size or how it is used. It also had to convey the overall strong and total corporate identity of the company and its subsidiaries (United Carbon Co., Inc.; United Producing Co., Inc.; and United Rubber & Chemical Co.)

United Carbon believes that its new trade mark meets the goals desired. It is unique in its modern, three-dimensional quality. This dimensional aspect is further enhanced by the fact that an actual globe, stationary or moving, can be used in a free-standing display (see illustration). It will be exhibited in this fashion in reception and lobby areas and at trade shows. The size requirement is met in that it may be reproduced at 3/8-inch on a business card or expanded to 60 feet high on the side of a building without special handling and therefore at minimum reproduction costs. The design is adaptable to either color or black and white presentation. One extra color gives the symbol a three-color look, and the black areas serve to get across visually the idea of carbon black.

The new design was used for the first time on the company's annual report which also gave some of the many reasons for a desire on the part of this expanding and diversifying company to seek a new identifying mark. Basic to this expansion was the $4 million spent during 1959 and the first quarter of 1960 to increase carbon black capacity to in excess of 400 million pounds per year.

United Carbon's new trade mark as a free standing display

In addition, the company moved its headquarters from West Virginia to Houston, Tex., and established a marketing division in New York. Purchase of sites and building plans were announced for research and development laboratories to house United's technical staff which has been enlarged more than 30% to increase work on product improvements and new products in the carbon black and polymer fields, to advance synthetic rubber compounding and processing, and to engage in basic research activities.

International expansion includes a jointly owned carbon black plant in Australia, enlargement of an affiliate in Wales, and formation of a subsidiary in France to build a 50-million-pound-a-year plant near Rouen.

Garlock, Inc., Plans To Buy Chetron Corp.

At the recent annual stockholders' meeting in Palmyra, N. Y., Garlock Packing Co. announced: it has contracted for the acquisition of Chetron Corp., Los Angeles, Calif., pending approval by the California Commissioner of Corporations; an approved corporate name change to Garlock, Inc., and the election of a new director—Donald A. Gaudion, president of Pfaudler Permutit, Inc.

Industry News

Chetron Corp., which was established on August 1, 1951, to manufacture commercial aircraft internal paneling, has expanded into plastic and fiberglass aircraft ducting, fiberglass aircraft lavatories and tanks plus molded exit cones and throat bushings for missiles. Garlock's position in missile work will be enhanced by the acquisition because Chetron is already engaged in considerable missile work, and the added facilities will improve service to Garlock's already existent missile customers on the West Coast.

Mr. Gaudion was elected a Garlock director to succeed retiring member Charles C. Congdon, a Palmyra attorney who has served on the board since 1929.

Chairman of the Board Robert M. Waples completed his active 40 plus years with the mechanical packing company when he adjourned the stockholders' meeting. He had previously announced that he would retire following the annual meeting. The directors do not anticipate filling the office.

J. T. Callaway Retires

J. T. (Tom) Callaway, assistant to the vice president of the Goodyear Tire & Rubber Co., Akron, O., and veteran of nearly 40 years of vigorous promotion of better national highways, retired April 1.

He joined Goodyear as a special aeronautics representative in 1918, became a manufacturers' sales representative at St. Louis in 1923, and was transferred to Chicago in 1927, where he served until 1940. He spent five years at Akron and was promoted to his most recent post, with headquarters at Chicago, in 1945.

In 1948, as president of the American Road Builders Association, he guided the management of the largest heavy equipment trade show in history. He chose as the site for the show a 30-acre tract on Chicago's lakefront near Soldiers' Field and then undertook to fill it with $10 million worth of giant machines.

He is a past president and a director of the Construction Industry Manufacturers Association as well as the American Road Builders Association. He has served as director of the International Road Federation and as chairman of the National Land Clearance Forum and National Committee for Farm Safety.

His election as president of the Auxiliary of the Farm Equipment Institute in 1957 marked the first time a tire industry man had headed the organization.

He is also a member of the Society of Automotive Engineers and helped organize the International Road Federation.

S. L. Karpeles Retires

S. L. Karpeles, vice president of Imperial Color Chemical & Paper Corp., Glens Falls, N. Y., which recently became a department of Hercules Powder Co., Inc., retired March 31 after 38 years in the chemical pigment color industry.

Mr. Karpeles started his employment with Imperial in 1935 as director of technical sales. In 1948 he became general manager of the pigment color divisions and the chemical division of Imperial and also a director of the company—positions he has held until his retirement.

During World War II, Mr. Karpeles was with the War Production Board on a dollar-a-year basis in charge of chemical pigment color activities. He is a past president of the Dry Color Manufacturers Association, and recently retired as chairman of the suppliers committee of the National Paint, Varnish & Lacquer Association.

He has been active in civic affairs in Glens Falls and is a past president of the Glens Falls Country Club.

U. S. Rubber Expands Basic Research Abroad

United States Rubber Co., New York, N. Y., has announced an expanded program of basic research in Europe providing for additional financial support to universities and increased contact with European scientific and engineering research activities. The company is allotting $120,000 for the support of the program. Seven universities in six countries are already receiving grants through the program, and additional universities are to be added.

Dr. Philip D. Brass, research associate from the company's Research Center, Wayne, N. J., will be in charge of the new program. As a full-time European representative of the research and development department, he will be located permanently in Paris, France, where he went last month.

Dr. Brass will keep the company's research organization informed of the latest scientific and engineering developments in universities and other organizations in Europe. He will cooperate with professors and their students in the universities in which the company supports basic research.

Universities now participating are Glasgow University, in Scotland; Imperial College of Science & Technology, University of London, England; University of North Staffordshire, England; University of Utrecht, the Netherlands; University of Liege, Belgium; University of Strasbourg, France; and Technische Hochschule in Aachen, West Germany.

Within the company Dr. Brass will promote the exchange of technical information between the U. S. Rubber research organization in the United States and personnel engaged in research activities in Europe.

Philip D. Brass

Dr. Brass was named a research associate at the Research Center last August. As a member of the latex and plastics research team, he has been working on new types of emulsion polymers. He joined U. S. Rubber at Passaic, N. J., in 1933, where he worked on the earliest latex foam and contributed much of the research that made possible Lastex yarn.

In 1937 he was transferred to the company's Providence, R. I., plant, where he developed neoprene Lactron rubber thread. He returned to the company's central research and development department in 1947 and has worked on synthetic latex foam, emulsion polymerization theory, and graft polymers.

Dr. Brass, a member of RUBBER WORLD's editorial advisory board since January, 1949, has resigned from this post because of his new activities abroad.

Bristol's 25th Year

Bristol Mfg. Corp., Bristol, R. I., celebrated its silver anniversary this spring, culminating 25 years of growth and successful operation as one of the top five footwear companies in the United States. The firm manufactures fabric and waterproof footwear, employing between 800 and 1,000 men and women.

Under the guidance of its founder and chairman of the board, Maurice C. Smith, Jr., and his brother, William H. Smith, president, the firm has pioneered and developed many advances in the industry.

Throughout World War II, Bristol was the largest producer of "A-6" flying boots for the Services. Also, the firm was instrumental in the production of the famous Korean Insulated Boot and is the leader today in its refinement of Bristolite's Thermoboot. Its inventor, Salvatore V. Gianola, is director of research and design for the firm.

Bristol is now producing fabric, rubber-soled footwear which includes sneakers, casual shoes, play shoes, sport shoes, and waterproof footwear including sportsmen's and industrial boots. The company has a wholly owned plastic footwear subsidiary, Plasti Products, Inc., Winona, Minn., which it acquired in June, 1958.

Celebrating its Silver Jubilee, the firm distributed to each employe $25 of salary in silver dollars, requesting that the dollars be spent in the usual retail outlets. Local merchants sponsored Silver Dollar Specials, and Chambers of Commerce in different cities are cooperating in the measurement of the economic impact of the project. With newspaper and television coverage, the firm's Open House attracted 2,350 visitors who were taken on conducted tours of the company's operations.

Brazilian Licensee Of Vinyl Foam Process

Licensing of the first South American firm to make vinyl plastic foam by the Elastomer process has been announced by the Girdler Process Equipment Division of Chemetron Corp., Louisville, Ky. The new licensee is Vulcan Artefatos de Borracha S.A., Rio de Janeiro, Brazil, which pioneered the latex foam business on a large scale in Brazil and which is an associate of Vulcan Material Plastico S.A., largest South American producer of vinyl laminates.

The Elastomer process uses inert gas instead of a chemical foaming agent to produce flexible vinyl foam by continuous-process methods. It makes possible production of vinyl foam in continuous lengths and in cored and contoured shapes and permits the foam to be heat-sealed readily by dielectric techniques to vinyl films, fabrics, and other forms.

The licensing agreement with Vulcan brings to 12 the number of companies in 10 overseas countries licensed to produce vinyl foam by the Elastomer process. The process is licensed by Union Carbide Plastic Co. division of Union Carbide Co. to a number of major rubber companies, vinyl processors, and furniture manufacturers in the United States.

The increase in number of overseas licensees indicates the growth of the plastics industry and particularly its phenomenal growth in Brazil, where the need to develop substitutes for imported metals has helped boost that country to fourth place among the world's plastics producers in less than 10 years.

Leon W. Miller

Leon Miller Retires From Allied Chemical

Leon W. Miller, assistant and consultant to the executive vice president and former director of chemical sales, plastics and coal chemicals division, Allied Chemical Corp., New York, N. Y., retired, effective April 4. Mr. Miller, whose entire business life of more than 44 years was spent with Allied, plans an extended European vacation.

Mr. Miller joined Allied as a building products salesman in Cleveland, O., in 1916. Upon his transfer to New York in 1930, he was named sales manager, specialties department, and within a year, manager of chemical sales for Allied's Barrett division. In 1958 he was appointed director of chemical sales for the plastics and coal chemicals division and last December was named to his most recent post.

A resident of South Orange, N. J., Mr. Miller is a member of Maplewood Country Club, the Downtown Athletic Club, and The Chemists' Club. He also is a member of the Salesmen's Association of the American Chemical Industry, the American Arbitration Association, and of the executive committee of the Drug, Chemical & Allied Trades Association. He is a past president of the Ohio Society of New York, and in 1959 he was elected to the board of directors of the New York Board of Trade.

General Realines Top Management

William O'Neil, founder in 1915 of The General Tire & Rubber Co., Akron, O., recently announced the first major management realinement in the firm's history. In action approved by the company's board of directors at its annual meeting, Mr. O'Neil continues as chairman of the board, with Michael Gerald O'Neil, formerly executive assistant to the president and vice president, succeeding his father as president of the company.

The board further authorized the naming of Thomas F. O'Neil, another son, who is president of the company's radio and television subsidiary, RKO General, Inc., to the position of vice chairman of the board, and elected L. A. McQueen, formerly vice-president-sales, as executive vice president. Also, the board confirmed the appointment of John O'Neil, another son, who is a director and the company's financial advisor, as chairman of the finance committee.

"Bill" O'Neil will continue as chairman of the seven-man executive committee on which the three sons, together with McQueen, C. J. Jahant, the company's manufacturing vice president, and D. A. Kimball, president of Aerojet-General, a subsidiary of General Tire, will also serve.

The board reelected all other officers of the company, including Jahant, Kimball, C. F. O'Neil, J. E. Powers, O. G. Vinnedge, H. M. Dodge, and J. A. Andreoli, vice presidents; C. A. Hill, treasurer; F. W. Knowlton, secretary; James Little and E. W. Lutz, assistant treasurers, and J. L. Wade, assistant secretary. All directors were reelected at the annual shareholders' meeting.

Mr. O'Neil commented, "The broadening of the management base, part of the company's long-range planning, is made at this time with an eye to the future so that we can continue our pace as the fastest growing company in the rubber industry. Our sales in 1959 reached more than $676 million, marking the tenth consecutive year that they have exceeded the previous year's mark."

Under the leadership of William O'Neil, The General Tire & Rubber Co. has become one of the nation's top corporations, with interests worldwide in rubber, plastics, chemicals, rockets and space exploration, wrought-iron and steel, and entertainment, having started in 1915 with a $200,000 capitalization.

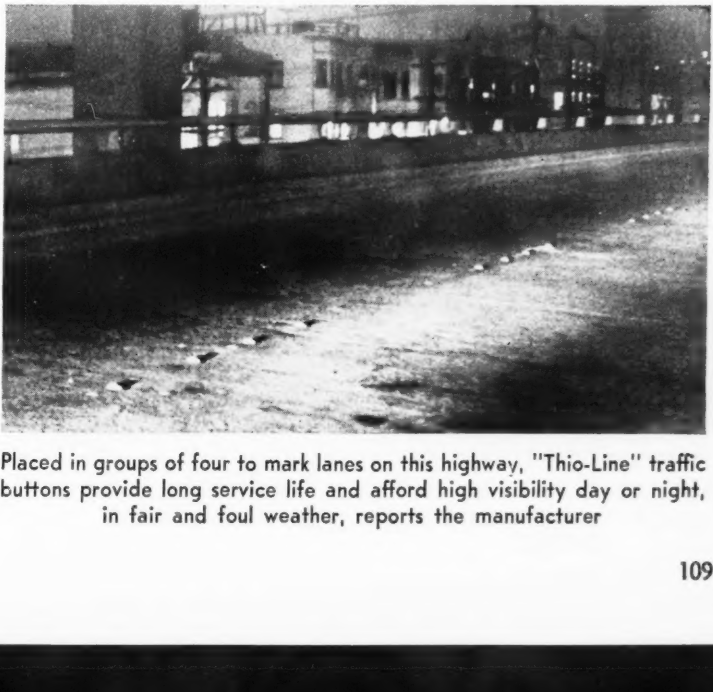
"Thio-Line" Buttons Mark Traffic Lanes

A new lane-marking traffic button made of polysulfide base ("Thio-Line") compounds and reflective glass beads that stays put on highways and crosswalks is being manufactured by Porce-Line Traffic Button Co., Dallas, Tex. These markers are easy to apply, and are highly visible at night and can be bonded to any pavement surface with a special concrete adhesive.

Developed initially by the State of California's Highway Materials & Research Department, the markers have been under in-service tests since 1954. The durable, impact-resistance markers are cast from polysulfide liquid polymer base compounds made by Thiokol Chemical Corp., Trenton, N. J. They are bonded to the pavement with a "Thio-Line" adhesive, a compound of similar ingredients.

The "Thio-Line" markers are four inches in diameter and about ⅜-inch high. Available in white or colors, they are easily installed. The pavement must be clean and free of oil and dust. The chemically cured adhesive is mixed and applied to the spot where the marker is to be placed. The button is then pressed in place.

With pavement temperatures of 70° F. or higher the bond will secure enough to reopen traffic within one hour. The curing can be accelerated, however, to a matter of minutes by the application of heat.



Placed in groups of four to mark lanes on this highway, "Thio-Line" traffic buttons provide long service life and afford high visibility day or night, in fair and foul weather, reports the manufacturer

RMA Molded, Extruded Group Annual Meeting

The Molded, Extruded, Lathe-Cut, and Sponge Rubber Products Subdivision of The Rubber Manufacturers Association, Inc., New York, N. Y., will hold its annual meeting at Skytop Lodge, Skytop, Pa., June 20-22. The theme of this year's meeting will be "Planning for Profits in the Sixties," and E. F. Callanan, Clevite-Harris Products, Inc., is chairman of the program committee.

A highlight of the meeting will be an address by Arthur S. Flemming, Secretary of the Department of Health, Welfare & Education, who will speak on the Food Additives Amendment of 1958.

Fred Tough, assistant to the president, Ohio Rubber Co., will discuss "Better Use of Statistics in Market Planning." J. T. Cahoon, manager, market research department, Firestone Tire & Rubber Co., will deal with the subject of "The Economic Outlook for the Sixties."

A panel discussion on "How To Get More Out of Your Sales Meetings" will be moderated by Everett Wright, director of sales, Johnson Rubber Co. Panelists include Floyd Melby, Goodyear Tire & Rubber Co.; Mathew J. Katis, Dryden Rubber Division, Sheller Mfg. Co.; and H. C. Dinmore, Tyer Rubber Co.

Canfield Acquisition Of Monroe Facilities

The H. O. Canfield Co., Clifton Forge, Va., and Seymour, Ind., has acquired the manufacturing facilities of Monroe Auto Equipment Co., Hillsdale, Mich. The acquisition, at an undisclosed price, was announced by Canfield officials on April 6.

All equipment of the Monroe plant for the production of rubber-to-metal parts will be moved to the Canfield plant at Clifton Forge, where all of the company's rubber operations are concentrated. This plant, constructed in 1954, was recently expanded to incorporate operations from the company's other plants as well as allow for future expansion and acquisition.

The Canfield company manufactures molded, extruded, and rubber to metal components for the automotive, aircraft, appliance, and business machine industries among others. The purchase of the Monroe facilities will enable Canfield to expand into the fields of rubber and metal bushings and other rubber products which require the use of automatic injection-type presses. In addition to these rubber parts, Canfield is a major supplier to the refrigeration industry of vinyl plastic door seals which are made at the Seymour plant.

NEWS BRIEFS

UNITED STATES RUBBER CO. is manufacturing at its Providence, R. I., plant a polypropylene fiber, designated Royalene UF, that resists the effects of sunlight. The fiber, developed chiefly for outdoor furniture webbing, has shown excellent performance in laboratory and Florida tests for a period of more than four years. It is said to have greater initial tensile strength than comparable polypropylene fibers and can be made in brighter colors than other sun-resistant synthetic fibers now available. Sales and manufacture of Royalene are centered at Providence, and samples are available from the Royalene department.

HERCULES POWDER CO., Wilmington, Del., has appointed L. H. Butcher Co., Los Angeles, Calif., distributor for its synthetics department resins. Butcher will handle the resins in the states of California, Oregon, Washington, Idaho, Nevada, and Arizona, augmenting the present synthetics department organization. Hercules synthetic resins are used in such industries as paint, varnish and lacquer, floor tile, adhesives, and ink. Butcher also is distributor for many products of Hercules naval stores and papermakers chemical departments.

COSMO WHEELS, INC., a new national marketing organization, has established an office and warehouse at 1019 W. Fulton St., Chicago, Ill. The new outfit is maintaining complete sales, service, and warehouse facilities for national distribution of standard contact wheels and other products manufactured by Chicago Rubber Co., Inc., and the newly developed and patented Cosmo R-100 molded rubber contact wheel used in grinding and polishing with coated abrasive belts and bands. Operations became effective March 10.

GENERAL LATEX & CHEMICAL CORP., Cambridge, Mass., has appointed King Chemical Corp., St. Louis, Mo., distributor for Vultafoam[1]—its new polyurethane foam material. King Chemical will serve the midwestern and western states for the sale and distribution of Vultafoam.

[1] Rubber World, Mar. 1960, p. 770.

INSTRON ENGINEERING CORP., Canton, Mass., has announced the development of its new Instron dynamic digital system which through modern electronic computer techniques permits high-volume, high-speed testing operations for quality control and statistical testing. The system consists of a standard Instron universal testing instrument equipped with encoders, memory storage units, and associated assemblies. Through binary decimal code, the system converts information normally presented in graphic form directly into automatic printing digital form. Characteristics which can be selected for print out include maximum load or stress; breaking load or stress; total extension; energy to break; load at preset extension or extension at preset load. Bulletin 26-D describing the system is available from the company.

UNION CARBIDE PLASTICS CO., New York, N. Y., is supplying Bakelite poly(vinyl chloride) resin for use in solid fuel rocket propellants. While quite fire-resistant in ordinary applications, in the propellant PVC reacts with ammonium perchlorate with a powerful release of energy. In an outstanding example of compounding, Atlantic Research Corp., Alexandria, Va., uses a plastisol technique to convert a mud-like slurry of vinyl resin, plasticizers, aluminum powder, and ammonium perchlorate into a powerful, reliable solid fuel propellant. Atlantic presently uses a casting process to produce the propellant; however, it also has in an advanced development stage a continuous extrusion process.

CATALIN CORP. OF AMERICA has completed its expansion of facilities to produce antioxidants at Fords, N. J. Major objective of the program was an increase of approximately 40% raising capacity to some 6,000,000 pounds per year, together with improved production efficiency and extra assurances of maintaining the highest product purity, the company said. Principal products in which Catalin has boosted production are butylated hydroxy toluene, which the firm markets as CAO-3, in both food and feed grades, and 2,6 - ditertiary - butyl - para - cresol, which Catalin sells as CAO-1, for rubber and other applications.

POLYSAR SS 250 FLAKE

Clean . . . Convenient . . . with Extraordinary Colour Retention Values

You'll find two extraordinary values in POLYSAR* SS 250 FLAKE, the self-reinforcing elastomer that is almost whiter than white. One is it's dust-free purity. The other is its superior original colour and colour-retention quality. These qualities bring you definite advantages in processing ease and in the use of colour in such products as nuclear and cellular soling, heels, floor tiles, luggage material, toys or household and sports goods.

The white dust-free flakes are uniform in size. Mixing time is cut by as much as 50%.

POLYSAR SS 250 is also available in bale form. For detailed information write: Marketing Division, Polymer Corporation Limited, Sarnia, Canada.

POLYMER CORPORATION LIMITED
POLYSAR
SARNIA CANADA

*T.M. Registered

ONE OF THE WORLD'S MAJOR SOURCES OF RUBBER

CONTINENTAL CARBON CO. will move its headquarters from Amarillo to Houston, Tex., according to H. R. Wall, president. The move, scheduled to begin in June, will be accomplished in several stages. Continental Carbon is one of the five largest producers of carbon black in the United States. Its four domestic plants are at Sunray, Tex.; Ponca City, Okla.; Lake Charles, La.; and Eunice, N. M. In joint ventures overseas, the company is participating in the construction of carbon blacks in Rotterdam, The Netherlands; Bordeaux, France; and Trecate, Italy.

B. F. GOODRICH CHEMICAL CO. has announced the full-scale production of a new reactive acrylic latex, Hycar 2671, for use as a finishing agent in the textile and other industries. The new product, produced at the firm's Louisville, Ky., plant, went on stream April 1. Hycar 2671, previously available in developmental quantities under the designation Hycar 2600X67, has been proved in such diverse applications as backings for upholstery and drapery fabrics, binder for non-woven fabrics, and as an adhesive or laminating agent. It also has been found useful in the field of paper saturations and leather finishing.

EASTERN STATES PETROLEUM & CHEMICAL CO., a division of Signal Oil & Gas Co., reports that the new address of its Chicago office is 1515 N. Harlem Ave., Oak Park, Ill. The phone number remains the same: Village 8-5410.

WYANDOTTE CHEMICALS CORP., Wyandotte, Mich., has been negotiating for the purchase of a plant site in Washington, N. J. Pending the outcome of the negotiations, Wyandotte plans to construct plant facilities to produce its broad line of polyether products, including Pluronic, Tetronic, and Pluracol compounds. These products are widely used in the manufacture of synthetic household cleaning and washing products, as well as in the manufacture of flexible and rigid polyurethane foams, elastomers, and coatings.

FOSTER D. SNELL, INC., New York, N. Y., in a move to expand its services in pharmacology, physiology, pathology, and biological sciences, has acquired Sperling Laboratories, Arlington, Va. Sperling has served its clients in the area of acute and chronic toxicity studies, preparation of petitions to FDA for clearance of drug and food-additive chemicals, and similar services. Foster D. Snell, Inc., intends eventually to consolidate Sperling into its newly expanded Baltimore division, Crippen Laboratories, Inc., located at 1500 Guilford Ave., Baltimore, Md.

SCOTT TESTERS, INC., Providence, R. I., will display three of its advanced physical testers at the ASTM (American Society for Testing Materials) Show in Atlantic City, N. J., from June 26 to July 1. The testers, the Scott Model CRE constant-rate-of-extension tester, the Model STI Mooney viscometer, and the Model E brittle point tester, help to make a wide range of physical testing procedures simple and accurate. The Model CRE tensile tester features a precise electronic weighing system and push-button controls, providing a variety of crosshead speeds, a wide selection of interchangeable test capacities, and instant response to rapidly fluctuating loads. The Model STI Mooney viscometer meets all requirements of ASTM D 1646 and ISO/TC45 Proposals 411 and 440. The Model E brittle point tester conforms with ASTM D 746 on vulcanized rubber and other elastomers.

DAYTON INDUSTRIAL PRODUCTS CO., a division of Dayco Corp. (formerly the Dayton Rubber Co.), has assumed responsibility for operations at the company's Three Rivers (Mich.) Rubber Corp. This facility is the production center for Dayton's line of specialized molded rubber and rubber-to-metal bonded parts widely used in the industrial and automotive fields. Gale Greenland, plant manager, will report to Robert G. Burson, vice president and general manager of Dayton Industrial in the organizational move.

Not a ski slide, this covered conveyor belt carries raw materials from a quarry to the plant of a Midwest brick maker. The belt was developed by Thor Power Tool Co.'s Cincinnati Rubber Mfg. Co., Cincinnati, O. Materials ride on a two-foot-wide belt beneath the white elliptical cover, traveling 1,492 feet

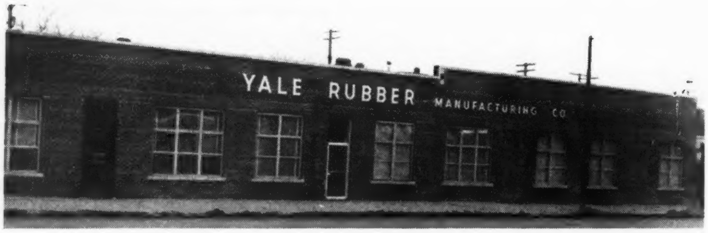
UNION CARBIDE CORP.'S silicones division has completed a new three-story, 155 by 66 feet, process development building at its plant in Long Reach, W. Va. The new building, equipped for a variety of work, contains equipment for both batch and continuous processes, high-pressure experimentation, reactions, and distillation of a wide range of products encountered in the processing of chlorosilanes and the various polymers and end-products derived from them. It also contains semi-works-size equipment for scale-up studies and the preparation of intermediate quantities of new materials for market exploration. Process development activities, previously done at Tonawanda, N. Y., have been transferred to Long Reach.

RUBBERMAID, INC., Wooster, O., a leading producer of rubber houseware goods, reports that housewives are showing increased preference for lighter, more sophisticated shades of colors, such as pastel yellow and sandalwood. The heavier colors—reds, blacks, greens—seem to be losing out, according to Donald E. Noble, president. Red, a longtime favorite, has given way to yellow as the major kitchen accessory color. The firm now issues quarterly color preference records based on the millions of kitchen and other housekeeping items made of molded rubber, plastic, and coated wire it sells each year.

TEXAS ALKYLS, INC., through its exclusive sales agent, Anderson Chemical division of Stauffer Chemical Co., New York, N. Y., announces a major price reduction for development quantities of five aluminum alkyls. The alkyls are TEAL (triethylaluminum); TIBAL (triisobutylaluminum); DEAC (diethylaluminum chloride); DIBAL (diisobutylaluminum hydride); and ethyl aluminum sesquichloride. The new price schedule is: ½ pound, $10.00 per pound; 4 pounds, $4.50 per pound; 16 pounds, $3.25 per pound; 32 pounds, $2.50 per pound; 40 pounds, $2.50 per pound; 150 pounds, $2.25 per pound; larger quantities, $2.00 per pound. All prices are delivered in the continental United States.

MANUFACTURING CHEMISTS' ASSOCIATION, INC., Washington, D. C., reports that H. E. Humphreys, Jr., chairman and chief executive officer, United States Rubber Co., and Arthur S. Flemming, U. S. Secretary of Health, Education & Welfare, will be principal speakers at MCA's eighty-eighth annual meeting to be held at The Greenbrier, White Sulphur Springs, W. Va., June 9-11. Mr. Humphreys' address is set for the business meeting, June 9. Secretary Flemming will speak at the annual banquet June 10. General John E. Hull, USA (Ret.), MCA president, will speak at the business meeting.

News Briefs



Increased sales and demands for additional warehouse space resulted in this expansion of Yale Rubber Mfg. Co.'s Detroit distributing division, at 3530 W. Fort St., Detroit, Mich. The warehouse and offices were renovated and expanded to 14,000 square feet of floor area. Accommodations are now provided for additional lines of nationally branded goods such as industrial hose, packing, belting, die rubber, gloves, boots, and other industrial rubber items

GENERAL ELECTRIC CO., Schenectady, N. Y., has received a $500,000-order for the electrical system for what is said to be the world's largest and fastest aircraft tire-testing machine. An integral part of the automatic testing machine being built by Adamson-United Co., Akron, O., the equipment will be installed this year at the Akron, O., plant of The General Tire & Rubber Co. A 10-foot-diameter steel road wheel will simulate landing and take-off conditions at speeds up to 350 mph. The wheel will be driven by a 10,000 hp. multiple-armature d.c. motor, controlled by amplidyne electronic speed regulators. A specially designed synchronous motor-generator set will supply power to the motor.

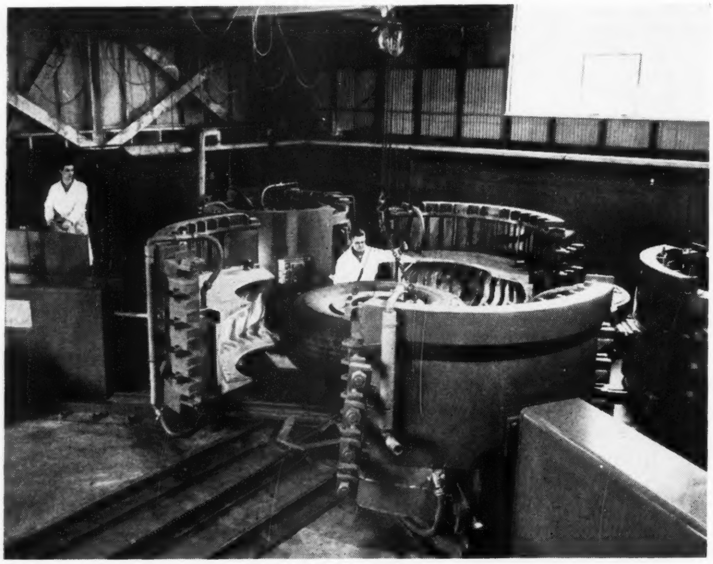
PARKER SEAL CO., division of Parker-Hannifin Corp., Cleveland, O., has appointed C. E. Conover & Co., Inc., Hasbrouck Heights, N. J., distributor for its O-rings, industrial and electromechanical lines. The Conover company, headed by C. E. Conover, president, and I. Pearce Edwards, vice president, will cover New Jersey, New York, Rhode Island, southern Connecticut, and eastern Pennsylvania. Conover, well known in the area for its engineering and service policies, will draw on the services of Jack Watson and George Moss, Parker sales engineers in the territory.

HERCULES POWDER CO., Wilmington, Del., has expanded its aid-to-education program, to provide matching contributions by the company for every dollar given to colleges by Hercules employes. The company now will equal, dollar for dollar, contributions made by employes and retired employes to any accredited college or university, up to a maximum of $1,000 for each employe in any calendar year. In February, Hercules announced the distribution of $110,000 to some 20 colleges and universities as unrestricted grants in aid for the current school year.

J. M. HUBER CORP.'S industrial products department, has moved its New England offices from Boston to 123 Water St., Watertown, Mass. (Phone is WAtertown 3-1013.) In addition to continuing to serve its rubber and paper industry customers in the New England area, the new office offers warehouse facilities for clays, chemicals, and carbon blacks. Vincent Casey continues to head sales of Huber products to the rubber industry; while sales to the paper industry are being handled by Maurice McGrath.

THE B. F. GOODRICH CO., Akron, O., plans what is said to be the world's largest high-speed tire test track at Pecos, Tex. The test track, which will enable BFG engineers to study tire performance under prolonged high speeds, will be a 24-foot-wide, two-lane roadway in a huge circle nine miles in circumference. It will accommodate 50 test cars and trucks operating at speeds of 70 to 90 miles an hour and could be used at speeds up to 150 miles an hour with a smaller number of vehicles in operation. This track will have its own service facilities and will employ from 175 to 200 people. Ground will be broken for the track about June 1, and testing operations should begin late this year.

DAYCO CORP., Dayton, O., (formerly the Dayton Rubber Co.) has organized Dayton Dayflex Plastics Co. which will control manufacturing and sales operations of a complete line of plastic vacuum cleaners, hair dryers, swimming pools, vent and exhaust hose. The new company absorbs all of the operations of the former Dayflex Plastics division of Dayton Rubber and will develop, test, and manufacture other specialized plastic products. Headquartering in Dayton, O., and operating as a division of Dayco, the firm will be headed by S. K. Lamden, general manager.



Kaiser Steel

An oversized tire is positioned for retreading in one of three molds on a unit which can retread three tires simultaneously. The unit was built by Bacon-American Corp., Emeryville, Calif., for Southern Supply Co., Louisville, Ky. Each mold opens into three sections to receive a tire. Three hydraulic cylinders close the mold around the tire. The mold then moves back on its track (lower left) during vulcanization so that one of the other molds (upper far right and in the background), may move into the center. The machine can retread tires that are more than 11 feet in diameter.

UNITED STATES RUBBER CO., New York, N. Y., reports that its Ensolite closed-cell vinyl sponge is being used as a shock absorbent material in a space-vehicle cabin mock-up designed at Wright-Patterson Air Force base, Dayton, O. The space cabins, bearing travel passengers in orbit in the future, may be lined with Ensolite. A Wright-Patterson research team is studying such problems as may be encountered and devising various solutions. Other features of the proposed space cabin include light weight, form-fitting seats to hold passengers in place, and a bed that gives the sleeper an illusion of having weight by putting slight pressure on certain muscles. Also, food will probably be packed in small rubber tubes, and the group is now working on a device to squeeze the food out in bite-size amounts.

MARTIN RUBBER CO., INC., Long Branch, N. J., has added to its product line a complete selection of ice skate scabbards. Six different sizes are offered in white, black, or in special colors. A high-grade stock with good abrasion resistance is being used. The skate scabbards are packed two to a polyethylene bag with an attractive leader. Inquiries from interested buyers are welcomed by the company.

MacEWAN & SMITH, INC., Doylestown, Pa., manufacturing engineer in rubber and related products, now becomes Rubbercrafters, Inc., according to William A. Roth, Jr., former general manager of M & S and now president with full control of the new corporation. It has retained the personnel of M & S, assuming the latter's obligations, commitments, and responsibilities.

PARKER - HANNIFIN CORP., Cleveland, O., has moved its field sales office from Hackensack, N. J., to new, larger quarters at 19 Railroad Ave., Emerson, N. J., according to Richard E. Hitchcock, regional manager. The new local phone number is COlfax 1-5757; while the New York exchange remains BRyant 9-0073. The Emerson office—with a sales engineering staff including S. R. Green, W. J. Reinecker, and N. E. Walsh—serves the metropolitan New York-New Jersey area on all Parker-Hannifin industrial hydraulic and pneumatic equipment. H. A. Ludlam is district manager of distributor sales in the area.

THE WARE CHEMICAL CORP., Westport, Conn., has appointed Wayne F. Anderson, of Anderson & Co., 504 Delaware Ave., Akron 3, O., agent in that area for the Ware predispersed chemicals sold under the trade name "Prespersions." These consist of chemicals used in rubber dispersed in a suitable plasticizer.

NEWS about PEOPLE

F. P. Steitz J. M. Flounders

Frank P. Steitz will head the new offices of the industrial products department, J. M. Huber Corp., at 12915 Memorial Drive, Houston, Tex. The new offices will serve customers in the rubber and paper industries through the Southwest and part of the Midwest. Steitz previously handled sales of clays, carbon blacks, and chemicals from the Chicago., Ill., office.

Marshall A. Williams is now director of marketing for Simplex Wire & Cable Co., Cambridge, Mass. Williams, who will direct the activities of the newly created marketing department, has been active in the electronic and electromechanical fields for the past 25 years.

Joseph N. Kuzmick, divisional manager of Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J., has been elected a director of the corporation. He was appointed divisional manager last April.

Howard Wood has been named a sales engineer, resins division, Catalin Corp. of America, and from the headquarters at New York, N. Y., will cover parts of the New England and Middle Atlantic states.

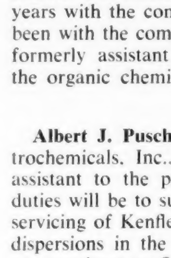
William L. Loving, vice president of Cabot Carbon Co. and for the past five years in charge of carbon black production in the Southwest, has been elected a vice president of the parent company, Godfrey L. Cabot, Inc., Boston, Mass. He will move to Boston, where he will have charge of carbon black research and technical service as well as domestic production.

James M. Flounders has been named vice president in charge of research and development for Boston Woven Hose & Rubber Division, American Biltrite Rubber Co., Inc., Cambridge, Mass. He was formerly director of new product development, B. F. Goodrich Industrial Products Co.

William C. Kay becomes general manager of the elastomer chemicals department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. He replaces **Charles Brelsford McCoy,** who succeeds **Harry F. Brown** as general manager of the explosives department. Brown has elected to retire after 43 years with the company. Kay, who has been with the company since 1934, was formerly assistant general manager of the organic chemicals department.

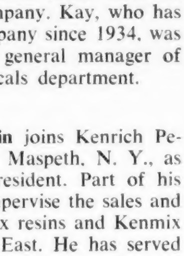
Albert J. Puschin joins Kenrich Petrochemicals, Inc., Maspeth, N. Y., as assistant to the president. Part of his duties will be to supervise the sales and servicing of Kenflex resins and Kenmix dispersions in the East. He has served as consultant to Ohio Rubber Co., and Thiokol Chemical Corp.

Henry R. Lasman will fill the newly created position of manager, organic chemicals division, National Polychemicals, Inc., Wilmington, Mass. Formerly manager of the firm's rubber laboratory and director of its technical service activities, Lasman will now be responsible for the commercial development of the line of organic chemicals and will continue to supervise the laboratory and its technical service operations.



Smith Studio

W. L. Loving



J. E. Purdy Co., Inc.

H. R. Lasman

News about People


J. T. Blake L. H. Clark

John W. Logan has been elected executive vice president; **John T. Blake,** senior vice president; and **G. J. Crowdes,** vice president, Simplex Wire & Cable Co., Cambridge, Mass. Logan, who will direct all operations of the company, and Blake, who will be responsible for all engineering and manufacturing activities, were also elected to the board of directors. Crowdes will be in charge of the company's engineering activities.

Charles R. Hamilton has been named a sales representative for the industrial chemicals department of Commercial Solvents Corp. and will be assigned to the Mid-Atlantic office at Newark, N. J. He will make his headquarters in Richmond, Va., and will cover Delaware, Maryland, and Virginia. **J. H. Brinton Marple** will now be attached to the Mid-Atlantic office as a resident salesman in Philadelphia, Pa. **Leon Seifert** has transferred from the Mid-Atlantic office to Houston, Tex., and will be attached to the New Orleans, La., district. **Winton J. Fowler,** formerly with the New Orleans sales office, has moved to Atlanta, Ga.; and **Walter J. Rushin,** previously at Atlanta, has been assigned to the San Francisco, Calif., office.

J. W. McCool has been appointed comptroller of the Fibrocast division of The Firestone Tire & Rubber Co., Akron, O. He formerly was on the auditing department staff.

Pitt B. Harris has been named general manager of the foam products division of Hewitt-Robins, Inc., and will be stationed at the Franklin, N. J., urethane foam plant. He will be responsible for the production, sales, product development, and all other phases of the company's synthetic foam products operation.

J. Fred Gregan has been named general manager for Cosmo Wheels, Inc., Chicago, Ill., recently established national marketing organization for Chicago Rubber, Co., Inc., and the newly developed and patented Cosmo R-100 rubber contact wheel. Gregan has had wide experience in the rubber industry.

Hugh C. Land has been elected group vice president, West, for Pennsalt Chemicals Corp., Philadelphia, Pa. He succeeds **Fred C. Shanaman,** who has retired from active service, but who will continue to serve as a consultant to the company. Land will make his headquarters at Tacoma, Wash., and will have jurisdiction over the two western operating divisions: agricultural chemicals and industrial chemicals-West. **Lee H. Clark** has been named group vice president, East, with jurisdiction over the three eastern operating divisions: chemical specialties, industrial chemicals-East, and international.


F. Wurtzell H. C. Land

Fred Wurtzell has been named manager, wire and cable market, Union Carbide Plastics Co., New York, N. Y., and will be responsible for the company's participation in the wire and cable industry. Prior to this appointment he was assistant regional manager, New England.

Henri Dupre has been named manager of Firestone Plantations Co.'s plantation in Itubera, Brazil. Formerly group superintendent of the plantation at Cavalla, Liberia, he succeeds **B. O. Vipond,** who retired after 30 years with Firestone. Dupre will have charge of all production and administrative operations on the 3,000-acre plantation which will have a portion ready for tapping this year.

Ira W. Hutchison, manager of international department, Dow Corning Corp., Midland, Mich., has also been named president of its new subsidiary, Dow Corning International, S. A. In addition, **Robert R. Peele** has been named treasurer and **Robert G. Kroeger,** sales manager. Dow Corning International will have its first office in Zurich, Switzerland.

Gavin A. Taylor has been named advisor on chemicals in the Eastern Hemisphere for Esso Export Corp., New York, N. Y. A veteran of 37 years in the rubber industry, Taylor will be based in London, England. Until recently he was with Enjay Co., Inc., where he served as assistant manager of the firm's former export division.


F. C. Shanaman R. P. Dinsmore

R. P. Dinsmore, vice president in charge of research and development, The Goodyear Tire & Rubber Co., Akron, O., has been elected a director of the company, according to **E. J. Thomas,** chairman of the board. The election of Dr. Dinsmore, who has been with the company 45 years, fills a vacancy resulting from the recent death of **Kenneth A. Spencer.**

Mrs. Rubie C. Gross is now manager of trade advertising and sales promotion for B. F. Goodrich Industrial Products Co., a division of The B. F. Goodrich Co., Akron, O. Prior to this appointment Mrs. Gross was sales promotion manager of the industrial products company.

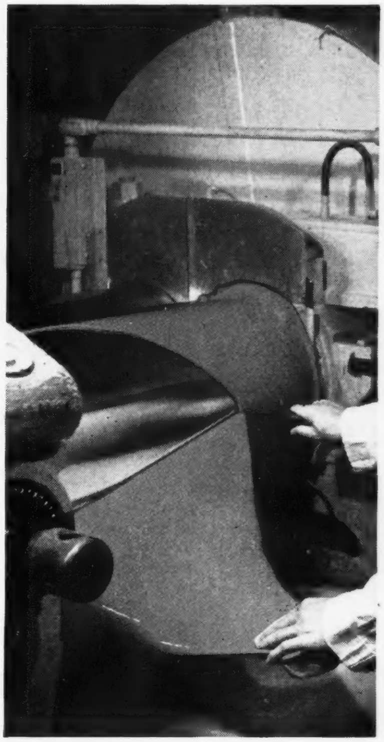
R. M. Waples, chairman of the board, Garlock Packing Co., Palmyra, N. Y., has announced his retirement from active service after 40 years with the firm in capacities ranging from file clerk to chairman of the board. He is not resigning, however, as a member of the board of directors.

George A. Hudson, chemist, Mobay Chemical Co., Pittsburgh, Pa., has received the firm's annual research award for his contributions to the development of urethane coating systems and polymer modifications. Since 1955, when he joined Mobay, Hudson has concentrated on the application of isocyanate chemicals to coatings for metals, leather, rubber, and flexible materials.

George Matacek has been promoted to chief chemist for Bee Chemical Co.'s recently established western division at 17000 S. Western Ave., Gardena, Calif. Formerly, Matecek served as a group leader in the company's research department in Chicago, Ill. The firm makes plastisols, and paints and finishes for plastics, metals and vacuum metalizing.

F. R. Perego is now general manager of the Brampton, Ont., Canada, plant operations of General Latex & Chemicals (Canada), Ltd. He has been with the company for more than 11 years, the last four at Brampton.

New Base For New Products



SILASTIC® SILICONE RUBBER Solvent-Resistant Masterbatch

For the first time solvent-resistant silicone rubber can be compounded by the rubber fabricator to his exact needs, through the use of new Silastic LS-422 Base. This masterbatch consists of a fluorocarbon silicone polymer and reinforcing silica.

Fuel, oil, and solvent-resistant stocks with hardnesses up to 80 durometer may be formulated from Silastic LS-422 Base. Elongation, tensile strength and other physical properties can be varied. In effect, this new base allows you to tailor-make stocks to meet your customer's requirements. Yet you need inventory only the one masterbatch.

Solvent resistance of stocks compounded from this base is comparable to that of the Dow Corning LS series. The photo at right above shows how little swell results when an extrusion of a stock made from LS-422 base is immersed for 24 hours in JP-4 jet fuel. Note swelling of regular silicone rubber part that was the same size at the start of the test.

Silastic LS-422 base processes easily during compounding . . . bands quickly, doesn't crumble, accepts fillers readily, can be stripped from mill rolls with a knife. Finished stocks can be molded, calendered or extruded. Even the most complex extruded shape is sharp and clear as shown in photo at above right. Write Dept. 9405 for full details.

Sample Recipes and Typical Properties

... For 50 Durometer Stock	
Silastic LS-422 Base	100 parts
Luperco CSF or Cadox TS-40	2 parts
Hi Sil X303	8 parts
* Durometer (Shore A)	50
Tensile Strength, psi	1000
Elongation, %	200
% Swell after 77 hrs @ 300 F in ASTM No. 3 Oil	5
... For 75 Durometer Stock	
Silastic LS-422 Base	100 parts
Luperco CSF or Cadox TS-40	2 parts
Hi Sil X303	5 parts
Super Neo Navacite	90 parts
* Durometer (Shore A)	75
Tensile Strength, psi	500
Elongation, %	120
% Swell after 77 hrs @ 300 F in ASTM No. 3 Oil	5

* Vulc. 5 min @ 240 F; cured 24 hrs @ 300 F.

Your nearest Dow Corning office is the number one source for information and technical service on silicones.

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

News about People


J. E. Hamlin R. L. Harden

James E. Hamlin has been appointed sales representative for the east central district, silicone products department, General Electric Co., and will make his office in Cleveland, O. He joined the company in 1954 as a test engineer. **R. L. Harden** is sales representative, eastern district, with offices in Philadelphia, Pa. He replaces **L. J. Sacks,** now western district sales manager. Harden has been with the department since 1955.

John Byrne has been appointed technical department flooring manager for Burke Rubber Co., San Jose, Calif. Previously he served as project engineer for floor covering at Pabco. **Harry Sullivan** becomes maintenance engineer in charge of the maintenance department.

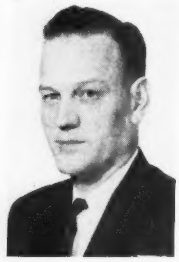
Donald O. McCarthy has been named assistant production manager for Petrothene polyethylene resins, U. S. Industrial Chemicals Co., division of National Distillers & Chemical Corp., New York, N. Y. He was previously area superintendent of the company's Tuscola, Ill., plant.

Ralph Neighbors and **Don McCoy** have joined the polymer chemistry and engineering group at Bendix Aviation Corp., Kansas City division, Kansas City, Mo. Neighbors comes to Bendix from Spencer Chemical Co., and McCoy from Thompson-Hayward Chemical Co.

Richard D. Rosenberg has been named vice president in charge of international operations for The Dayton Rubber Co., Dayton, O. He will have full responsibility for operations of Dayton Rubber International, a division formed last year to coordinate all the company's overseas activities.

James M. Gavin has been elected president of Arthur D. Little, Inc., Cambridge, Mass., to succeed **Raymond Stevens,** now chairman of the executive committee. Lt. Gen. Gavin (USA ret.) joined the company as vice president in 1958 after retiring as Chief of Army Research and Development.

Edmond V. Tyne has been appointed sales manager for Harchem Chemical department, Wallace & Tiernan, Inc., Newark, N. J. He was previously eastern regional sales manager for Minnesota Mining & Mfg. Co.'s chemical divisions.

T. I. Veiock H. E. Pence

Theodore I. Veiock has been appointed plant manager of the Lee Division operations, Lee Rubber & Tire Corp., at Conshohocken, Pa. He joined the company in April 1959, as assistant to the president.

Henry E. Pence becomes manager of technical service for the zinc oxide department of St. Joseph Lead Co. and will make his office at the Monaco, Pa., plant. Formerly assistant superintendent of the department, Pence will now be responsible for liaison between the plant and laboratory and the sales department; for field problems concerning zinc oxide applications; development and dissemination of new technical data; and field calls with distributors to assist customers.

Kenneth T. Mecklenborg has joined the basic research department of Emery Industries, Inc., Cincinnati, O. Dr. Mecklenborg is engaged in mechanism reaction studies and structure determinations currently being conducted by the department.

Karl O. Nygaard becomes manager of wholesale staff in replacement tire sales, B. F. Goodrich Tire Co., a division of The B. F. Goodrich Co., Akron, O. In his new capacity, he will direct tire advertising, dealer services and dealer expansion, sales training, auto and home supplies sales, and budget sales. He was formerly corporate director of business research.

L. T. N. Tinkham will fill the newly created position of assistant sales manager, Plastic & Rubber Products Co., Los Angeles, Calif. He will assist **E. F. Noyes,** vice president of sales, in the overall direction and supervision of sales activities for the firm. Tinkham has been with the company 14 years, and has served both in the laboratory and in the sales department.


E. V. Tyne J. L. Talley

J. L. Talley is now Midwest sales representative, Falls Engineering & Machine Co., Cuyahoga Falls, O. He will represent the company in Illinois, Wisconsin, Indiana, and Iowa, in the roller die cutter and splitting machine lines.

E. O. Edelmann, has been named factory manager of the West Haven, Conn., plant, Armstrong Rubber Co. For the past ten years he was assistant factory manager and a member of the staff in charge of quality and production control for all the company's plants.

Justin A. Lewis, Jr., is now sales manager for barium and magnesia products, mineral products division, Food Machinery & Chemical Corp., New York, N. Y. **Robert Mawe** succeeds him as district sales manager for the Cincinnati, O., district. In addition, **Ralph Skarr** becomes assistant manager of the phosphate division; while **John Campbell** has been named assistant manager for barium and magnesia products.

Alfred E. Van Wirt has been appointed assistant general manager of Imperial Color Chemical & Paper Department, Hercules Powder Co., Glens Falls, N. Y. **Nathan W. Putnam** becomes assistant general manager, director of pigment color sales; and **Laurence R. Sherman,** manager of the pigment color division.

Ernst G. Kuehn is now European representative for Jefferson Chemical Co., Inc., Houston, Tex. Educated in Germany, Kuehn has had broad experience in international sales and commerce. Prior to his new appointment he was in foreign marketing operations for the agricultural and fine chemicals division, American Cyanamid Co.

Robert L. Girton becomes factory manager, The Dayton Tire & Rubber Co., division of Dayco Corp., Dayton, O. He succeeds **O. H. Stork,** who retired after 36 years with the company. Girton will have full responsibility for all phases of tire production.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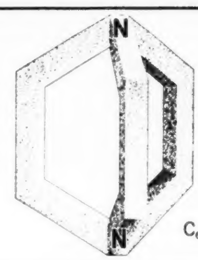

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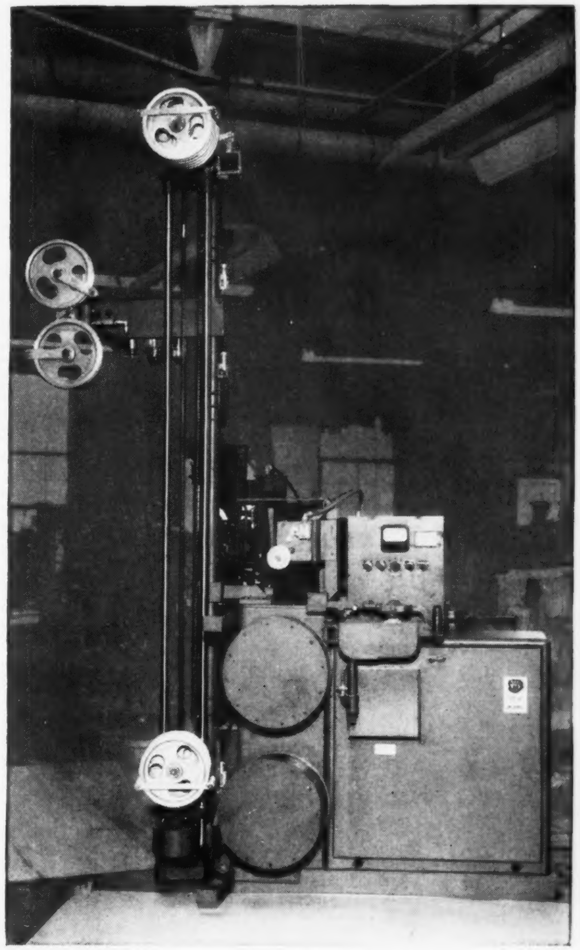

News about People

Lee Cisneros is now director of traffic and sales services, Godfrey L. Cabot, Inc., Boston, Mass. Prior to this appointment he was general traffic manager.

Clide I. Carr and **Charles P. Roe** have been appointed senior research scientists at the Research Center of United States Rubber Co., Wayne, N. J. Dr. Carr, who is in the radiation research and fiber departments, is engaged in research on the preparation and evaluation of new fibers. Dr. Roe, a member of the latex and plastics department, conducts studies on the production of synthetic polymer dispersions.

Roscoe A. Pike and **Thomas C. Williams** have been promoted to research supervisors at the laboratory of Silicones Division, Union Carbide Corp., Tonawanda, N. Y. Dr. Pike has been working in the field of silicones since he joined the company in 1953. Williams has been with Union Carbide since 1955. Both have been specializing in research in the silicone rubber field.

Louis J. Croce has been appointed supervisor of the Petro-Tex research department at the Food Machinery & Chemical Corp. chemical research center, Princeton, N. J. **William F. Brill** becomes research associate; and **Robert H. Jones,** manager of technical development.

Rudolf H. Hertzog has been named chief product engineer, wire and cold rolled steel products, John A. Roebling's Sons Division, The Colorado Fuel & Iron Corp., Trenton, N. J. Until his present assignment, he served as metallurgical engineer in the Roebling wire mills.

James L. Foster has been appointed manager, polyethylene sales, Goodrich-Gulf Chemicals, Inc., Cleveland, O. He was previously a technical representative, market development (polyethylene).

Albert H. Pflugh becomes assistant manager of the Mid-Atlantic district, Enjay Co., Inc., New York, N. Y. He was previously head of marketing coordination of the company's chemical division.

Joseph H. Bernstein has been made market research analyst, silicone products department, General Electric Co., Waterford, N. Y. He joined the company in 1955 as a process engineer.

Harry B. Warner becomes president of B. F. Goodrich Chemical Co., Cleveland, O., a division of The B. F. Goodrich Co., Akron, O. He succeeds **John R. Hoover** who has retired after 35 years with the company. Prior to this appointment Warner was vice president, marketing, of the division.

Fabian Bachrach

L. Cisneros

Madison Geddes

H. B. Warner

•

J. E. Trainer *(right)*, executive vice president, The Firestone Tire & Rubber Co., Akron, O., congratulates Gosta Osterman, president and owner of the Viskafors Gummifabrik Co., manufacturer of Firestone tires in Viskafors, Sweden, on his factory expansion plans. A 75,000-square-foot addition to Viskafors' facilities, scheduled for completion later this year, will enable the plant to double last year's tire output. The tire manufacturer's sales offices, Firestone Gummi Co., are located in Stockholm, Sweden. In 15 years Osterman has built a dealer organization of 1,200 dealers which last year helped produce the highest sales volume ever recorded in the history of the company.

Pelletized News

(Continued from page 20)

Research on isoprene, including its production from propylene and ethylene, is to be undertaken by a Japanese group including Resource Technology Testing Laboratory, Nihon Synthetic Rubber Co., and the Chiyoda company.

B. F. GOODRICH CHEMICAL CO., Cleveland, O., has announced that a substantial expansion of the synthetic rubber producing facilities of N. V. Chemische Industrie Aku-Goodrich (Ciago) at Arnhem, Holland, is now under way, with completion scheduled for early 1961. Ciago is a jointly owned company formed in 1958 by B. F. Goodrich Chemical Co. and Algemene Kunstzijde Unie N. V. of Arnhem. Production began in Ciago's original facilities in the Summer of 1959. The plant produces SBR latex, used in making foam rubber; high-styrene reinforcing polymer, used mainly in shoe soles; and Hycar nitrile latex, which goes into a variety of products.

The Royal Dutch Shell factory being built at Pernis, near Rotterdam, Netherlands, is to begin producing synthetic rubber soon. The first Shell synthetic rubber plant outside the United States, it is to manufacture the full line of synthetic rubbers now made by the concern in the United States, with the exception of black masterbatches and latices.

JAPAN'S *Plastics Industry News* indicates American and other foreign firms have been evincing much interest in the locally produced polyvinyl alcohol fiber, marketed as Vinylon, with tire cord production in view. Kurashiki Rayon Co., it seems, has already entered an agreement with Air Reduction Corp., by which the American firm will acquire technical know-how for producing Vinylon in America, with the intention of eventually using it for tire cord.

The production of the first Russian tubeless tires by radiation vulcanization has been described by M. Ya. Kaplunov and co-workers.[1] The 6.70-15 tubeless automobile tires used nylon-6 cord, impregnated with a latex composition containing resorcinol-formaldehyde resin, in carcass and breaker strip, and the dry method instead of the Goodrich wet method of radiation was used; the radiation source was heat-producing elements of an atomic reactor with a wide spectrum of gamma radiation with an average energy of about 1 Mev. The tires were pronounced satisfactory, but still have to undergo road tests.

[1] *Soviet Rubber Technology*, Nov., 1959, p. 45.

(Continued on page 144)

OBITUARIES

Charles T. Young

Charles T. Young, who had been active for 62 years in the rubber industry, died April 2 after prolonged illness, at the age of 90.

Mr. Young started as factory clerk, in 1891, with New York Belting & Packing Co. He joined The Manhattan Rubber Mfg. Co., Passaic, N. J., as assistant factory manager, in 1895 and later became, successively, factory manager (1911), secretary (1913), a director (1914), and, in 1916, vice president. When the company merged to form Raybestos-Manhattan, Inc., the deceased continued as factory manager at the Passaic plant until his retirement in 1946.

He was an early experimenter with Mexican guayule shrub rubber and saw that Manhattan was the first company to use it commercially. In addition he was president of Manhattan Securities Co., which controlled the Manhattan rubber plantations in Java; he held this office until 1953.

He is survived by his wife, a daughter, a grandchild, and three great-grandchildren.

Charles A. Reed

Charles A. Reed, retired official and former assistant to the president of Seiberling Rubber Co., Akron, O., died suddenly on March 23 in Charlotte, N. C.

Mr. Reed joined the sales department of The Goodyear Tire & Rubber Co. in 1914 when F. A. Seiberling was president. Reed was the third person hired in 1921 for Seiberling Rubber, and when he retired in 1955, he was the employe with the longest record of service. In 1945 he was named assistant to the president and held that position until 1948, when he became general sales manager. He resumed his duties as assistant to the president in 1953.

Reed organized the Seiberling 25-Year club and was its first president.

The deceased was born 71 years ago at Glenford, O., and came to Akron in 1914.

Funeral services were held March 28 at The Billow Memorial Chapel, Cuyahoga Falls, O., and burial took place in Greenlawn Memorial Park, Akron.

He is survived by his wife, a daughter, and two grandchildren.

Thomas R. Benton

Thomas Robert Benton, corporate staff director of industrial engineering and industrial relations of the Armstrong Rubber Co. plants, died in New Haven, Conn., on March 18 of complications following a heart operation.

Mr. Benton entered the rubber industry in 1932 as a supervisor in United States Rubber Co.'s Williamsport, Pa., plant. He became personnel manager for Pennsylvania Rubber Co., Jeannette, Pa., in 1936.

He joined Armstrong as industrial engineer at its Natchez, Miss., plant in 1939 and subsequently became industrial relations manager at the Des Moines, Iowa, plant, in 1943 and then chief industrial engineer at the West Haven, Conn., plant in 1949. The deceased later held the position of corporate staff director of industrial engineering and industrial relations over all the Armstrong plants. As a member of the staff he operated the Natchez plant in 1950 and 1951.

He was born on May 24, 1910, at Franklin, Pa. Mr. Benton was graduated from Lycoming College and received a master's degree in industrial engineering from Carnegie Institute of Technology. He was a member of the Rubber Manufacturers Association's manufacturing committee and wage and salary group, and a former member of American Management Association, Society for Advancement of Management, and Research Institute of America. He was also a 32nd degree Mason, a Shriner, and a member of the New Haven Country Club.

Funeral services were held March 22 at the Spring Glen Congregational Church, Hamden, Conn.

Mr. Benton leaves his wife and two daughters.

John R. Byers

John Richard Byers, vice president and superintendent in charge of plants, Industrial Rubber Goods Co., St. Joseph, Mich., died March 24 as a result of an automobile accident.

He joined the company in 1935 as a machine shop foreman, after having been a tool and die maker at Mull Tool Works. In his most recent capacity he was vice president in charge of production and superintendent of the company's three plants.

Mr. Byers was born April 11, 1910, at Kings Landing, Mich. He was graduated from Benton Harbor High School. He was a member of the Berrien County Sportsmen's Club, the Lakeshore Lodge No. 298, F&AM, the DeWitt Clinton Consistory, and Saladin Temple.

Funeral services were held March 28 in the First Congregational Church, with burial at Riverview Cemetery, St. Joseph.

He is survived by his wife, two daughters, his mother, and a sister.

Harold D. Tompkins

Harold D. Tompkins, a vice president of The Firestone Tire & Rubber Co., Akron, O., died suddenly April 17, while visiting his daughter in Boston.

Mr. Tompkins joined the company 41 years ago as a general line salesman. He subsequently held the positions of manager of truck tire sales for the West Coast division and sales manager for the parent company in Akron. In 1941 he was elected vice president in charge of trade sales and held that position until 1957, when he continued as a vice president.

Born August 17, 1893, in Ontario, Canada, Mr. Tompkins later moved to Akron. He was a member of the Akron City Club, Portage Country Club, and the Akron Chamber of Commerce.

Funeral services were held at the First Congregational Church, Hudson, O., on April 20. Interment took place in Forest Lawn Memorial Park, Glendale, Calif., on April 22.

He is survived also by his wife, a son, and a brother.

Tuanku Abdul Rahman

Tuanku Abdul Rahman ibni Al-Marhum Tuanku Muhammed, the first Supreme Head of State of the Federation of Malaya, died suddenly, April 1.

The nine Malay rulers elected him to serve a five-year-term as the first Yang di-Pertuan Agong, August 3, 1957. Before that he had succeeded his father as ruler of the state of Negri Sembilan.

He was born on August 24, 1895. He was educated at the Malay School, Kuala Jampol, and the Malay College, Kuala Kangsar.

Official mourning began April 1 and continued for 44 days. His body lay in state at the Istana Negara (Royal Palace) April 2, and a state funeral was held the following day.

C. P. Hall

Charles P. Hall, president, The C. P. Hall Co., died suddenly April 17 at his home in Akron, O. His obituary will appear next month.

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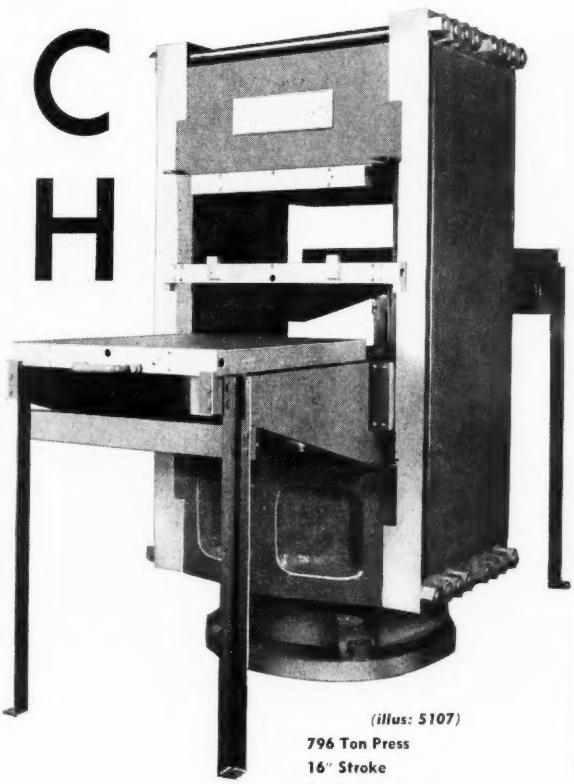

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MARKET REVIEWS

Synthetic Rubber

Consumption of new rubber in the United States for March totaled 143,590 long tons, compared with the 138,745 long tons consumed during February. Synthetic rubber production, amounting to 131,897 long tons for March, set a new monthly high, as compared with the previous peak of 130,742 long tons recorded in January 1960, according to the monthly report of The Rubber Manufacturers Association, Inc.

Consumption of all types of synthetic rubber reaches 96,730 long tons during March, contrasted with February's consumption of 92,590 long tons. Synthetic rubber accounted for 67.37% of total new rubber consumption, against the February ratio of 66.73%.

Consumption by type in March, compared with February usage, increased for all types, as follows: SBR, 80,170, against 76,590; neoprene, 7,485, against 7,130; butyl, 6,100, against 5,900; and nitrile, 2,975, against 2,970 (figures are in long tons).

Total synthetic rubber exports for March increased to 33,430 long tons from 31,300 long tons in February; while total synthetic stocks increased to 227,325 long tons from 224,793 long tons in February.

Trends in SBR masterbatches showed the oil-black masterbatch production up to 23,825 long tons in March from 20,533 long tons in February. Carbon black masterbatches also increased in March to 4,018 long tons from a production of 3,361 long tons in February. The oil-extended rubber production showed another increase in March, to 30,651 long tons from 29,561 long tons in February.

Natural Rubber

During the March 16-April 15 period there were no outstanding features in the natural rubber market. In spite of quiet conditions in the consumer markets, a steady undertone prevailed, with prices fluctuating within rather narrow limits. An exception was the March position of the Rex contract in New York, which before its expiration shed its premium over May and at times was quoted at a discount. This state of affairs reflects the much easier position of near rubber in that market, a change from conditions which have prevailed for many months.

Under the influence of the continued bullish sentiment in Singapore, due in part to a report that Russia had bought 3,000 tons of United Kingdom stockpile rubber, the Singapore market has held the initiative, while London and New York have followed the lead from there. They have done so, however, on their own relatively lower levels and with a conspicuous absence of any sustained consumer demand.

The bullish sentiment in Singapore is attributed to the mere fact that China is in the market, coupled with the expectation of Russian buying of larger quantities, rather than to the size of the account of China which is stated to have been fairly consistent at about 2,000 to 3,000 tons a week. Late reports indicate that Russia may have bought a further 7,500 tons for April and May shipment.

Toward the end of March the U. S. House of Representatives passed a bill authorizing the sale of 470,000 long tons of natural rubber from the national stockpile over a nine-year period. The bill would carry out a recommendation of the Office of Civil & Defense Mobilization. Under the terms of the resolution a graduated scale will set a 30¢-a-pound minimum on sale of government owned rubber, with no stockpile sales to be made when the market falls below that figure.

Sales of natural rubber from the national stockpile reached 10,073 long tons in March, bringing to 57,629 tons the total sold since the disposal got under way last October. The General Services Administration also announced that it has 63,554 long tons of rubber, as of April 1, available for sale on the open market.

Japan Rubber Manufacturers Association has announced that Japan's output of rubber articles is expected to increase by about 8.5% annually and to reach the 319,000-ton crude rubber level by 1965. This figure would represent a 50% increase over the 212,000-ton output estimated for 1960.

March sales, on the New York Commodity Exchange, amounted to 14,130 long tons, compared with 12,280 long tons for February contract. There were 23 trading days in March, and 23 during the March 16-April 15 period.

On the physical market, RSS #1, according to the Rubber Trade Association of New York, averaged 40.74¢ per pound for the March 16-April 15 period. Average March sellers' prices for representative grades were: RSS #3, 40.57¢; #3 Amber Blankets, 40.01¢; and Flat Bark, 36.61¢.

Latex

There was no significant change in the drum latex market during the March 16-April 15 period. Some inquiries of a moderate degree have been received, and it has just been possible to meet this demand from the limited quantities available for reasonably early shipment. Little interest has been shown in deliveries further forward, according to trade sources.

The bulk latex market remains very quiet.

Shipments of latex from Malaya during February totaled 11,367 tons, against 11,286 tons in January. About 2,709 tons were shipped to the United Kingdom, 1,900 to the United States,

REX CONTRACT

1960	Mar. 18	Mar. 25	Apr. 1	Apr. 8	Apr. 14
Mar.	41.50	40.25	....	....	....
May	40.85	40.50	40.00	40.30	40.10
July	39.95	39.66	39.40	39.70	39.35
Sept.	39.45	39.10	38.90	39.25	38.90
Nov.	38.60	38.50	38.40	38.90	38.35
1961					
Jan.	37.90	38.00	37.50	38.30	38.05
Mar.	37.30	37.00	36.60	37.65	37.45
May	....	....	36.00	37.20	37.00

NEW YORK OUTSIDE MARKET

	Mar. 18	Mar. 25	Apr. 1	Apr. 8	Apr. 14
RSS #1	41.50	41.00	40.38	40.50	40.38
#2	41.38	40.88	40.25	40.38	40.25
#3	41.25	40.75	40.13	40.25	40.13
Pale Crepe					
#1 Thick	46.50	46.00	45.38	45.75	45.63
Thin	47.75	47.25	46.63	47.00	46.88
#3 Amber Blankets	40.75	40.00	39.63	39.63	37.00
Thin Brown Crepe	40.75	40.00	39.63	39.50	39.38
Standard Flat Bark	36.75	36.63	36.38	36.50	36.38

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NATIONAL-STANDARD COMPANY
Niles, Michigan

Market Reviews

and 1,478 to Japan, compared with 2,630, 1,794, and 1,823 tons, respectively, during January.

Consumption in the United States during February amounted to 5,459 tons, against 5,487 tons in January.

Prices for ASTM centrifuged concentrated natural latex, in tank-car quantities, f.o.b., rail tank car, ran about 47.60¢ per pound solids. Synthetic latices prices were 26.0 to 40.25¢ for SBR; 37 to 57¢ for neoprene; and 45 to 60¢ per pound for the nitrile types.

(All figures in long tons, dry weight)

Type of Latex	Production	Imports	Consumption	Month End Stocks
Natural				
Jan.	0	5,339	5,491	12,781
Feb.	0	*	5,463	12,974
SBR				
Jan.	9,720	—	8,094	7,781
Feb.	9,862	—	7,838	8,606
Neoprene				
Jan.	1,154	0	999	1,680
Feb.	1,085	0	969	1,534
Nitrile				
Jan.	1,131	0	1,117	2,799
Feb.	1,098	0	1,000	2,535

Scrap Rubber

During the first part of the March 16-April 15 period there were few new developments in the scrap rubber market. Business continued at a steady, but unexciting pace, with mills taking in material regularly. Some consumers appeared to be more interested, at this time, in tubes. Synthetic butyl tubes were bringing 7.50¢ at both eastern and midwestern points.

Later in the period under review fairly good activity was noted in the market. Prices showed little change although No. 1 truck peelings were stronger at $33 at Midwest points. In the East mixed auto tires were at $7.00-$12.50, and at $12.50 in the Midwest.

NAWMD members who attended the forty-seventh annual convention at the Waldorf-Astoria, New York, N. Y., March 12-15, bade farewell to the name National Association of Waste Material Dealers. This was the last convention at which this 47-year-old name was used. Beginning June 1, the name, National Association of Secondary Material Industries, will go into effect. It will be represented by the initials NASMI.

	Eastern Points Per Net Ton	Akron, O. Per Net Ton
Mixed auto tires	$7.00	$12.50
S.A.G. truck tires	nom.	17.00
Peeling, No. 1	nom.	33.00
2	nom.	22.00
3	nom.	19.00
Tire buffings	nom.	nom.
	(¢ per Lb.)	
Auto tubes, mixed	5.50	6.00
Black	5.75	5.75
Red	6.25	6.25
Butyl	7.50	7.50

Reclaimed Rubber

The reclaimed rubber industry enjoyed a strong first quarter, probably because of the large number of automobile units made in that time. The replacement tire, hose, and belting segments were also strong in that period. The high inventory of unsold automobiles, however, has caused a cutback in production, and it is expected that the repercussions will be felt back to the reclaiming industry, reports an eastern reclaimer.

The start of the second quarter, therefore, appears to be slower, although this situation is expected to be temporary.

Leaders in the reclaimed rubber field are predicting further strong gains both in production and sales for the year. It is generally estimated that production in 1960 will total about 330,000 long tons. This figure compares with production in 1959 of 303,343 long tons and output in 1958 of 259,578 long tons.

Consumption this year should climb to 300,000 long tons, against use in 1959 of 286,410 long tons that were valued at $63,010,200. In 1958, consumption totaled 248,156 long tons valued at $54,594,300.

A reclaimer in the Midwest reports that business between the March 16-April 15 period was steady, but not so good as had been expected, owing partly to the fact that weather has held back the expected pickup. Orders on hand at the time of writing indicated good business in April, but nothing unusual.

According to The Rubber Manufacturers Association, Inc., report, March production of reclaimed rubber was 29,050 long tons; while consumption was 26,500 long tons. February figures had been: production, 27,025 long tons; consumption, 25,680 long tons.

Reclaimed Rubber Prices

Whole tire, first line	$0.115
Third line	.1075
Inner tube, black	.17
Red	.21
Butyl	.16
Light carcass	.22
Mechanical, light-colored, medium gravity	.185
Black, medium gravity	.10

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims, in each general group separately featuring characteristic properties of quality, workability, and specific gravity, at special prices.

Industrial Fabrics

The industrial grey cotton goods market during the March 16-April 15 period, being in a state of seasonal transition, was full of marketing inconsistencies, according to trade sources. For this period, quotations remained nominally unchanged. As to the price trend, pros and cons were noted, some preparing for firmness, even advances; but the more convincing impression gained was that lower levels were in the making in respective wide and heavy cloth categories.

Comfort was taken by textile manufacturers during the second week of April when Detroit and other cities reported that early March dealer sales showed peak automobile business had been transacted. With the advent of warmer weather, though somewhat intermittent, consumers began doing what they had deferred, and that helped the position of fabric coaters as tangible trade improvement made headway.

Trade people who considered it not the right time to take a positive position regarding industrial grey goods prices await the period when mills will need new and large orders, and buyers will become time conscious of their requirements. Whatever may turn out to be the levels at which volume business will be done, the conclusion is that, from that point on, firmness will follow, and higher prices will cause early buyers to gain advantages over the slow movers.

Here and there, the fill-in business was a mixed affair. Some sharp premiums were paid for scarce goods. Where second hands tried to sell surpluses, the already familiar below regular prices were paid. In numerous fabrics, it was reported, there was no giving ground to buyers' lower bids for quick deliveries. As mills' order backlogs lessened, buyers drew closer to the time to replace commitments for July forward end-uses.

Industrial Fabrics

Drills*

59-inch, 1.85, 68x40	*yd.*	$0.40
2.25, 68x40		.34

Broken Twills*

54-inch, 1.14, 76x52	*yd.*	.52
58-inch, 1.06, 76x52		.585
60-inch, 1.02, 76x52		.5825

Osnaburgs*

40-inch, 2.11, 35x25	*yd.*	.2275
3.65, 35x25		.1525
59-inch, 2.35, 32x26		.30
62-inch, 2.23, 32x26		.31

Ducks

Numbered Duck†

List less 45%

Enameling Ducks*

	S. F.	D. F.
38-inch, 1.78 yd.	$0.3263	.3313
2.00 yd.	.275	.33
51.5-inch, 1.35 yd.	.4738	.4888
57-inch, 1.22 yd.	.4838	.50
61.5-inch, 1.09 yd.	.5413	.5538

Hose and Belting Ducks*

Basis	*lb.*	.67

Army Duck†

52-inch, 11.70 oz., 54x40 (8.10 oz. /sq.yd.)	*yd.*	.5925

* Net 10 days.
† 2% 10 days.

Sheeting*

40-inch, 3.15, 64x64	yd.	$0.2175
3.60, 56x56		.185
52-inch, 3.85, 48x48		.245
57-inch, 3.47, 48x48		.25
60-inch, 2.10, 64x64		.39
2.40, 56x56		.345

Sateens*

53-inch, 1.12, 96x60	*yd.*	.645
1.32, 96x64		.575
57-inch, 1.04, 96x60		.615
58-inch, 1.02, 96x60		.7025
1.21, 96x64		.6275

Chafer Fabrics*

14.40-oz./sq.yd. P.Y.	*lb.*	.74
11.65-oz./sq.yd. S.Y.		.65
10.80-oz./sq.yd. S.Y.		.68
8.9-oz./sq.yd. S.Y.		.70
40-inch, 2.56, 35x25		.25
60-inch, 1.71, 35x25		.435

Rayon and Nylon

There were no price changes in either rayon or nylon cord during the period under review (March 16-April 15).

The nylon tire cord picture continues to look good. In the first quarter of 1960 a new record for shipments of nylon tire yarn was established, breaking the previous record established in the final quarter of 1959.

The introduction of nylon cord third-line tires probably has aided in the upswing of nylon yarn shipments, but the continuing penetration of nylon into the replacement market also has had a beneficial effect, reports a trade source. Also helpful is the steadily expanding use of nylon yarn in the truck tire market.

Several organizations which sell large quantities of replacement tires have swung in the direction of nylon exclusively. With the approach of summer and vacation travel increasing, the fact that Cities Service, largest turnpike service-station operator, and other similar marketing companies stress nylon cord tires will most likely boost the use of these tires still further.

American Enka Corp. announced plans in March to expand its annual capacity to produce heavy denier nylon 6 yarns by 3,000,000 pounds, to be available in 1961. This poundage, together with 3,500,000 pounds previously scheduled for production this fall, will give Enka an annual capacity of 6,500,000 pounds of heavy denier yarns. The new capacity will be used in the production of tire yarns, auto upholstery, and other products.

Total packaged production of rayon and acetate filament yarn during March was 62,000,000 pounds, consisting of 27,500,000 pounds of high-tenacity rayon yarn, and 34,500,000 pounds of regular-tenacity rayon yarn. Total packaged production for February had been: total, 57,900,000 pounds; high-tenacity, 25,800,000 pounds; and regular-tenacity, 32,100,000 pounds.

Filament yarn shipments for March to domestic consumers totaled 56,200,000 pounds, consisting of 24,500,000 pounds of high-tenacity rayon yarn and 31,700,000 pounds of regular-tenacity rayon yarn. Shipments for February had been: total 55,900,000 pounds; high-tenacity, 25,100,000 pounds, regular-tenacity, 30,800,000 pounds.

End-of-March stocks for rayon and acetate filament yarn were: total, 61,700,000 pounds; high-tenacity, 16,200,000 pounds; regular-tenacity, 45,500,000 pounds. End-of-February stocks had been: total, 58,200,000 pounds; high-tenacity, 15,000,000 pounds; and regular-tenacity, 43,200,000 pounds.

Rayon Prices

Tire Fabrics

1100/490/2	$0.625/$0.78
1650/908/2	.685
2200/980/2	.655

Tire Yarns

High-Tenacity		
1100/ 490, 980	.57/	.66
1100/ 490	.57/	.66
1150/ 490, 980	.59/	.63
1165/ 480	.59/	.66
1230/ 490	.59/	.63
1650/ 720	.50/	.60
1650/ 980	.50/	.58
1875/ 980	.55/	.58
2200/ 960	.49/	.57
2200/ 980	.49/	.57
2200/1466	.49/	.64
4400/2934		.60
Super-High Tenacity		
1650/ 720	.50/	.60
1900/ 720		.58

Nylon Prices

Tire Yarns

840/140	.97
1680/280	.97

•

Biggest conveyor belt ever shipped by air (more than 4 tons) is loaded aboard a plane at New York's Idlewild airport for rush shipment to Iran. Made to order by The B. F. Goodrich Co., Akron, O., the 400-foot-long belt was delivered to a dam construction site in Iran in three weeks after receipt of order. It was made for Morrison-Knudsen International Constructors

Synthetic Rubbers and Latices*

Monomers

11-80, 100, 200, 112-3 Triols	lb.	$0.255	
11-300	lb.	.265	
-400	lb.	.325	
Acrylonitrile	lb.	.27	
Butadiene	lb.	.15	
Dow Styrene	lb.	.12	
H99, N99	lb.	.205	
RG	lb.	.17	
Vinyltoluene	lb.	.17	
Hylene M	lb.	1.25 /	$2.75
M-50	lb.	.86 /	2.36
T	lb.	.85 /	2.41
TM	lb.	.70 /	2.26
-65	lb.	.75 /	2.31
Isobutylene	gal.	.38	
Isoprene	lb.	.25	
Mondur-C	lb.	1.05	
Multron R-2	lb.	.54	
P200	lb.	.23	
Rohm & Haas ethyl acrylate	lb.	.34 /	.36
Glacial methacrylic acid	lb.	.40 /	.425
Methyl acrylate	lb.	.37 /	.39
Methacrylate	lb.	.29 /	.31

Shortstops

4P Mercaptan	lb.	.27 /	.31
DDM	lb.	.94 /	.975
Mercaptan 174	lb.	.38 /	.50
Sharstop 204	lb.	.38 /	.42
268	lb.	.52 /	.53
Tecquinol	lb.	.825 /	.845
Thiostop K	lb.	.50 /	.53
N	lb.	.38 /	.47
Vulnapol KM	lb.	.52 /	.56
NM	lb.	.38 /	.42
Wingstop B	lb.	.38	

Acrylic Types

Acrylon BA-15	lb.		1.25
EA-5	lb.		1.00
Hycar 4021	lb.	1.34 /	1.35

Latices

Hycar 2600X30, 2600X39, 2601	lb.	.50 /	.56

Butadiene Types (BR†)

Cis-1	lb.	.35[b] /	.50[b]

Cold BR Latex

Pliolite Latex 2104		.325

Fluorocarbon Types

Fluorel KF-2141	lb.	10.00 /	10.25
Kel-F Elastomer	lb.	15.00 /	16.00
5500, 820 (Latex)	lb.	15.00 /	17.15
Viton A, AHV	lb.	10.00 /	10.25
B	lb.	13.00	

Isobutylene Types (IIR)

Enjay Butyl 035, 065, 150, 215, 217, 218, 325		.23
165, 268, 365		.24
Hycar 2202	.65 /	.75
Polysar Butyl 100, 200, 300 400		.245
101		.2775
301		.255
Vistanex LM		.45
MM		.35

Neoprene Types (CR)

Neoprene Type AC, AD, CG	.55 /	.575
FB	.65 /	.675
GN, GN-A, WB, WX	.41 /	.435
GRT, S	.42 /	.445
KNR	.75 /	.775
W, WHV	.39 /	.415
W-M1	.40 /	.415
WRT	.45 /	.475

Latices

Neoprene Latex 571, 842-A	.37 /	.47
572	.39 /	.49
60, 601-A	.40 /	.50
635	.41 /	.51
400, 650	.42 /	.52
735, 736	.38 /	.48
750	.39 /	.49
950	.47 /	.57

Nitrile Types (NBR)

Butaprene NF		.49[b]
NH		.65[b]
NL		.50[b]
NXM		.58[b]
Chemigum, N1NS		.64[b]
N3NS, N5		.58[b]
N6, N-6B, N7, N8		.50[b]
N600		.50[b]
Hycar 1001, 1041	$0.58 /	$0.59
1002, 1042, 1043, 1052, 1053, 1312	.50 /	.51
1014	.60 /	.61
1072	.64 /	.65
1411	.62 /	.63
1432, 1441	.59 /	.60
Paracril, AJ	.485 /	.495
B, BJ, BJLT, BLT	.50 /	.51
C, CLT	.58 /	.59
CV	.63 /	.64
D	.65 /	.66
OZO	.46 /	.47
18-80	.60 /	.61
Polysar Krynac 800, 802, 803		.50
801		.58

Latices

Butaprene N-300		.46[b]
N-400, N-401		.54[b]
Chemigum 200		.49[b]
235 CHS, 236		.54[b]
245 B, 245 CHS, 246, 247, 248		.46[b]
Hycar 1512, 1552, 1562, 1577	.45 /	.52
1551, 1561, 1571	.53 /	.60
1852	.46 /	.52
Nitrex 2612	.45 /	.52
2616	.53 /	.60
2619	.52 /	.59
2620, 2625	.45 /	.52
Tylac 640	.45 /	.52
740	.49 /	.56
840	.53 /	.60
1640	.54 /	.61

Polyethylene Type

Hypalon 20	lb.	.4975
30	lb.	.6275
40	lb.	1.5275

Polysulfide Types

Thiokol LP-2, -3, -31, -32, -33		.96
-8		1.35
-205		4.00
Type-A		.50
FA		.69
ST		1.25

Latices

Thiokol Latex (dry wt.) Type MX		.80
WD-2		1.25
-6	.80 /	1.25

Silicone Types

GE (compounded)	2.29 /	4.90
Silicone gum	3.85 /	4.55
Silastic (compounded)	2.95[b] /	3.50[b]
(Partly compounded)	3.15[b] /	3.60[b]
(Uncompounded)	4.05[b] /	4.35[b]
LS-53	12.00 /	16.30
Union Carbide (compounds)	2.35[b] /	3.20[b]
(Gums)	3.85[b] /	4.25[b]

Styrene Types (SBR)‡

Hot SBR

Ameripol 1000, 1001, 1006, 1007	.24 /	.247
1002	.2435 /	.2495
1006 Crumb	.2475 /	.2535
1009	.2475 /	.2535
Crumb	.259 /	.265
1011	.2475 /	.2535
1012	.2425 /	.2485
Crumb	.249 /	.255
1013	.241 /	.247
Crumb	.2615 /	.2675
ASRC 1004, 1006	.241 /	.2475
1009	.2475 /	.2535
1018	.27 /	.276
1019	.265 /	.271
Copo 1006	.241 /	.247
FR-S 1000, 1001, 1004, 1006	.241 /	.247
1007	.241 /	.247
1009	.2475 /	.2535
1010	.26 /	.266
1012	.2425 /	.2485
1013	.241 /	.247
Crumb	.2615 /	.2675
1014	.281 /	.287
141	.28 /	.286
181	.241 /	.247
Naugapol 1016, 1019	.265[b] /	.27[b]
1018	.27[b] /	.275[b]
1021	.30[b] /	.305[b]
1022	.295[b] /	.30[b]
1023	.315[b] /	.32[b]
6003	.27[b] /	.275[b]
Philprene 1000, 1001, 1006, 6701	.241[b] /	.247[b]
1009	.2475[b] /	.2535[b]
1018	.27[b] /	.276[b]
1019	.265[b] /	.271[b]
Plioflex 1006	.241 /	.247
Polysar S-630	.241 /	.247
S-X-371	.255 /	.261
S-1000, -1006, -1013		.23
-1002, -1011		.2325
-1009		.24
Synpol 1000, 1001, 1006, 1007, 1013, 1061	.241[b] /	.247[b]
1002	.2435[b] /	.2495[b]
1012	.2425[b] /	.2485[b]
1009	.2475[b] /	.2535
8000	.241[b] /	.247[b]
X-274	.255 /	.261

Hot SBR Black Masterbatch

Philprene 1100		$0.194
1104		.190[b]
S-1100		.185

Hot SBR Latices

Copo 2000		.2775
FR-S 2000, 2001	$0.2725 /	.3425
2002	.35 /	.36
2003, 2004	.305 /	.36
2006	.29 /	.382
Naugatex 2000, 2001	.2775 /	.3575
2002	.30 /	.37
2006	.29 /	.42
Pliolite Latex 2000, 2001		.2825
2076		.295
Polysar Latex II		.29
IV		.2775
S-2000, 2006		.26

Cold SBR

Ameripol 1500, 1501, 1502, 4600	.241 /	.247
ASRC 1500, 1502	.241 /	.247
1503	.2625 /	.2685
3105, 3106	.241 /	.247
3110	.26 /	.266
C-102		.23
Copo 1500, 1502, 1507	.241 /	.247
1505-NS	.261 /	.267
FR-S 1500, 1502, 146, 179	.241 /	.247
127	.26 /	.266
Gentro 1500		.241
Naugapol 1503	.2625[b] /	.2675[b]
1504	.33[b] /	.335[b]
6100	.31[b] /	.315[b]
Philprene 1500, 1502	.241[b] /	.247[b]
1503	.2625[b] /	.2685[b]
Plioflex 1500C, 1502, 1507, 1510	.241 /	.247
Polysar Kryflex 200		.251
252		.27
Krylene NS		.241
SS-250, SS-250-Flake		.2875
S-1500, S-1502		.23
1509		.23
Synopol 1500, 1502, 1551, 8103	.241[b] /	.247[b]

Cold SBR Black Masterbatch

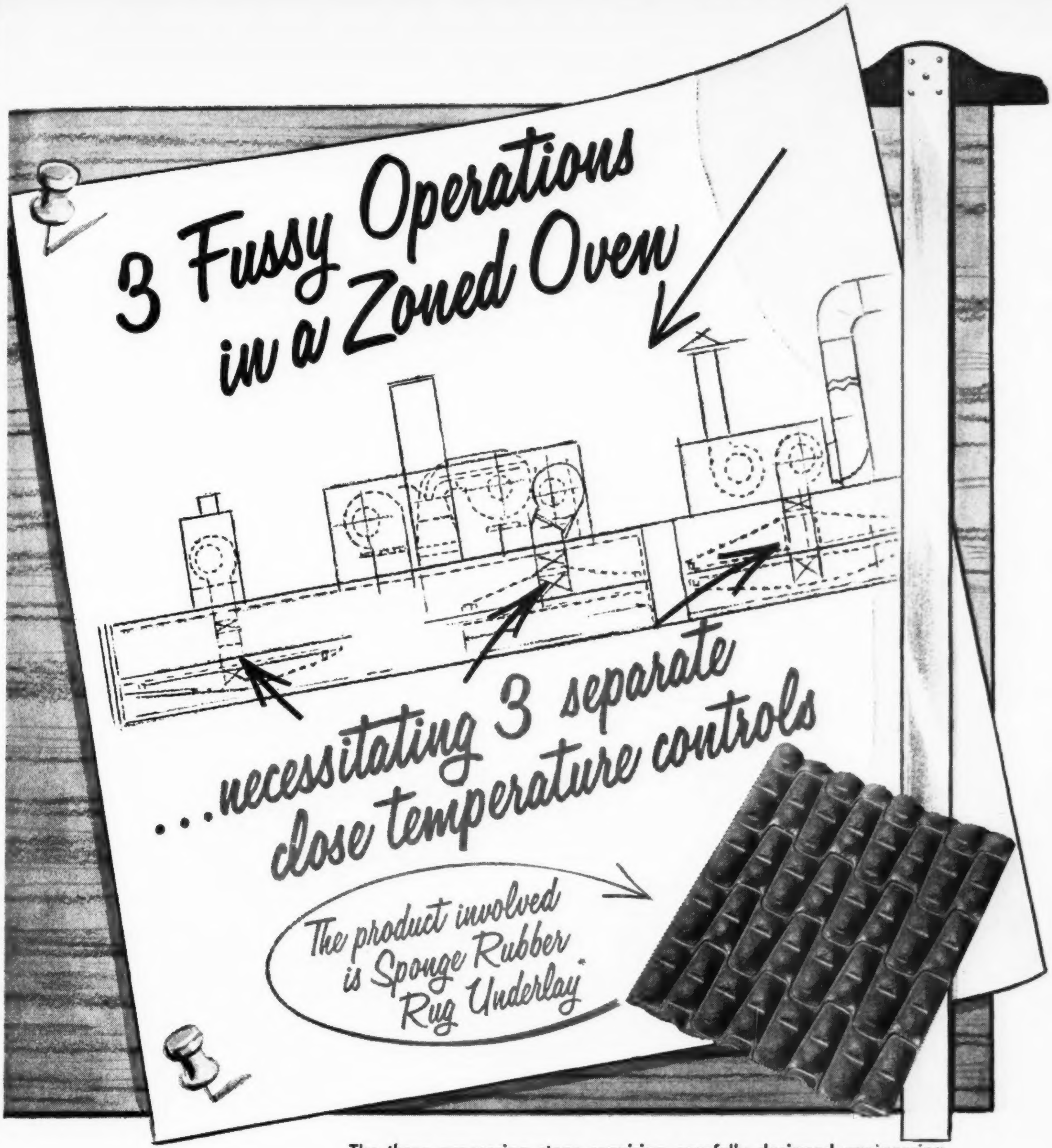
Ameripol 1605	.19 /	.196
4651	.177 /	.183
4659	.182 /	.188
4660	.187 /	.193
Baytown 1600, 1601, 1602		.193[b]
Carbomix 3750	.182 /	.188
3752	.1845 /	.1905
3756	.1569 /	.1629
CB-102		.185
Gentro-Jet 9152		.208
9153		.182
9154		.1845
Philprene 1601	.193[b] /	.199[b]
1603	.196[b] /	.202[b]
1605	.19[b] /	.196[b]
S-1600, -1602		.1825
-1605		.18
S-1600, -1602, -1604		.1825
-1605		.18
-1606, -1607		.175
-7652		.1875
OB-116		.181
Synpol 8151	.182[b] /	.188[b]
8152	.186[b] /	.192[b]

Cold SBR Oil Masterbatch

Ameripol 1705	.2035 /	.2095
1707, 1708	.191 /	.197
1710, 1712	.1885 /	.1945
4700	.175 /	.181
4701	.1725 /	.1785
ASCR 1703	.206 /	.212
1708	.191 /	.197
1712	.1885 /	.1945
1713	.175 /	.181
Copo 1712	.1885 /	.1945
1713	.175 /	.181
1714	.1725 /	.1785
1773	.206 /	.212
1778	.191 /	.197
FR-S 1703	.206 /	.212
1710	.1885 /	.1945
1712	.1885 /	.1945
123	.196 /	.202
154, 155	.1885 /	.1945
173	.206 /	.212
178	.191 /	.197
Gentro 1712		.1885
Philprene 1703	.206[b] /	.212[b]
1708	.191[b] /	.197[b]
1712	.1885[b] /	.1945[b]
Plioflex 1703, 1773	.206 /	.212
1710C, 1712C	.1885 /	.1945
1713	.175 /	.181
1714C	.1725 /	.1785
1773	.206 /	.212
1778	.191 /	.197
Polysar Krynol 651		.1885
652		.191
S-1703		.195
-1707		.18
-1709, -1710, -1712		.1775
-1778		.18
Synpol 1703	.206[b] /	.212[b]
1707, 1708	.191[b] /	.197[b]
1712	.1885[b] /	.1945[b]

(Continued on page 144)

[a] Freight extra.
[b] Minimum freight allowed.
[c] Freight prepaid.
* Prices are per pound carload of tank-car dry weight unless otherwise specified.
† BR—Butadiene rubber.
‡ SBR—Styrene-butadiene rubber.



The three processing steps requiring carefully designed engineering and operational controls are:

1...**creation of conditions to induce just the right 'sag' for developing the waffle pattern.**

2...**'blow' which causes the chemicals in the rubber mix to produce expanding gases which, in turn, create the sponge consistency.**

3...**curing of the rubber.**

In these zones, temperatures of the entering hot air must be kept within ±5°F. Temperatures on the work itself are held to ±3°F.

It would be difficult to find a more exacting problem in dryer/oven design. It was a job that called for more than 'rule-of-thumb' talents in design and construction.

*Manufactured by The Mansfield Tire & Rubber Co., Capistrano Beach, Calif., for Orcco Industries, Inc.

In addition to this multi-zone dryer/oven unit, Ross Engineers designed a Direct Flame Fume Incinerator to eliminate the odor and smoke from the oven operations.

J.O. ROSS ENGINEERING

A Division of Midland-Ross Corporation/730 Third Ave., New York 17, New York

ATLANTA • BOSTON • DETROIT • LOS ANGELES • SEATTLE • MT. PROSPECT, ILL.

Compounding Ingredients*

Abrasives

Pumicestone, powdered	lb.	$0.0363	$0.065
Rottenstone, domestic	lb.	.03	.04
Shelblast	ton	80.00	165.00
Walnut Shell Grits	ton	50.00	160.00

Accelerators

A-1 (Thiocarbanilide)	ton	.74	.81
A-32	ton	.66	.80
A-100	lb.	.52	.66
Accelerator B	lb.	.92	
49	lb.	.59	.60
52	lb.	1.14	
57, 62, 67, 77	lb.	1.04	
66	lb.	4.25	
89	lb.	1.20	
108	lb.	.92	
552	lb.	2.25	
808	lb.	.66	.68
833	lb.	1.17	1.19
Altax	lb.	.54	.56
Amax	lb.	.75	.77
No. 1	lb.	.71	.73
Arazate	lb.	2.25	
Beutene	lb.	.66	.68
Bismate	lb.	3.00	
B-J-F	lb.	.27	.32
Butazate	lb.	1.04	
Butyl Eight	lb.	1.10	1.35
Namate	lb.	.45	.50
Zimate	lb.	1.04	
Ziram	lb.	.89	1.04
Captax	lb.	.44	.46
Conac S	lb.	.76	.78
C-P-B	lb.	1.95	
Cumate	lb.	1.45	
Cydac	lb.	.71	.73
Cyuram DS, powder	lb.	1.14	
Pellets	lb.	1.14	
MS, powder	lb.	1.14	
Pellets	lb.	1.14	
Cyzate B, E	lb.	.87	.89
Delac-S	lb.	.71	.73
DIBS	lb.	.85	.87
Dipac	lb.	.85	
DOTG (diorthotolylguanidine)			
Cyanamid	lb.	.69	.70
Du Pont	lb.	.69	.70
DPG (diphenylguanidine)			
Cyanamid	lb.	.49	.50
Monsanto	lb.	.49	.50
El-Sixty	lb.	.62	.64
Ethazate	lb.	1.04	
50-D	lb.	.87	.89
Ethyl Selram	lb.	3.00	
Thiurad	lb.	1.04	
Thiuram	lb.	1.04	
Tuads	lb.	1.04	
Tuex	lb.	1.04	
Zimate	lb.	1.04	
Ziram	lb.	.89	1.04
Ethylac #650	lb.	.93	.95
Guantal	lb.	.62	.64
Hepteen Base	lb.	1.85	
Ledate	lb.	1.04	
MBT (2-mercaptobenzothiazole)			
American Cyanamid	lb.	.44	.46
Du Pont	lb.	.44	.46
Naugatuck	lb.	.44	.49
-XXX, Cyanamid	lb.	.55	.57
MBTS (mercaptobenzothiazyl disulfide)			
Cyanamid	lb.	.54	.56
Du Pont	lb.	.54	.56
Naugatuck	lb.	.54	.56
-W Cyanamid	lb.	.59	.61
Merac #225	lb.	.75	1.05
Mertax	lb.	.55	.57
Methazate	lb.	1.04	
Methyl Thiuram	lb.	1.14	
Tuads	lb.	1.14	
Zimate	lb.	1.04	
Monex	lb.	1.14	
Mono-Thiurad	lb.	1.14	
2-MT (2-mercaptothiazoline)			
Cyanamid	lb.	.88	.90
Du Pont	lb.	1.00	
NA-22	lb.	1.05	
NOBS No. 1	lb.	.71	.73
Special	lb.	.75	.77
O-X-A-F	lb.	.55	.57
Pennac SDB	lb.	.45	.48
Pentex	lb.	1.24	
Flour	lb.	.30	
Permalux	lb.	2.25	
Phenex	lb.	.52	.59
Pip-Pip		2.07	
Polyac Pellets	lb.	1.85	
R-2 Crystals	lb.	4.35	
Rotax	lb.	.55	.57
RZ-50, -50B	lb.	1.00	
S.A. 52	lb.	1.14	
57, 62, 67, 77	lb.	1.04	
66	lb.	3.00	
Santocure	lb.	.71	.73
NS	lb.	.71	.73
Selenac	lb.	3.00	
SPDX-GH	lb.	.69	.74
GL	lb.	1.20	1.34
Sulfads	lb.	1.98	
Tellurac	lb.	1.30	1.55
Tepidone	lb.	$0.45	
Tetrone A	lb.	1.98	
Thiates	lb.	.88	$1.25
Thiofide	lb.	.54	.56
Thionex	lb.	1.14	
Thiotax	lb.	.44	.46
Thiurad	lb.	1.14	
Thiuram E	lb.	1.04	
M	lb.	1.14	
Trimene	lb.	.56	.58
Base	lb.	1.03	1.06
Tuex	lb.	1.14	
Ultex	lb.	1.00	1.10
Unads	lb.	1.14	
Ureka Base	lb.	.66	.73
Vulcacure NB	lb.	.45	
NS	lb.	.75	1.05
T.M.D.	lb.	1.14	
ZB, ZE, ZM	lb.	.85	.89
Z-B-X	lb.	2.45	
Zenite	lb.	.54	.56
A	lb.	.69	.71
AM	lb.	.76	.78
Special	lb.	.55	.57
Zetax	lb.	.55	.57
Zimate	lb.	1.04	
ZMBT	lb.	.55	.57

Accelerator-Activators, Inorganic

Lime, hydrated	ton	21.96	
Litharge, comml.	lb.	.1425	.1575
Eagle, sublimed	lb.	.1535	
National Lead, sublimed	lb.	.1585	
Red lead, comml.	lb.	.185	.195
Eagle	lb.	.1575	
National Lead	lb.	.1625	.1645
PRD-90	lb.	.38	.50
White lead, carbonate	lb.	.19	.20
Eagle	lb.	.17	.18
National Lead	lb.	.18	.19
Silicate	lb.	.1725	.1825
Eagle	lb.	.1475	.22
National Lead	lb.	.165	.175
Zinc oxide, comml.†	lb.	.145	.155

Accelerator-Activators, Organic

Aktone	lb.	.2125	.2325
Barak	lb.	.65	
Capital 170	lb.	.20	.25
171	lb.	.1425	.1925
225, 258, 710	lb.	.14	.19
261	lb.	.155	.18
262	lb.	.16	.185
263	lb.	.1775	.2025
270	lb.	.1175	.1425
Curade	lb.	.57	.59
D-B-A	lb.	1.95	
Emery 600	lb.	.1325	.1825
G-M-F	lb.	2.60	2.65
PDD-70	lb.	2.70	3.00
PGD-25	lb.	1.25	1.50
Groco 30	lb.	.1325	.1825
Guantal	lb.	.62	.64
Hyfac 410	lb.	.1425	.1675
430	lb.	.18	.205
431	lb.	.2025	.2275
Hystrene S-97	lb.	.1863	.2125
T-45	lb.	.1638	.19
T-70	lb.	.1738	.20
Industrene B	lb.	.1263	.1525
R	lb.	.1138	.14
158	lb.	.1313	.1575
254	lb.	.1413	.1675
262	lb.	.1513	.1775
Laurex	lb.	.37	.39
MODX	lb.	.295	.345
NA-22	lb.	1.05	
PND-70	lb.	1.35	1.60
Oleic acid, comml.	lb.	.185	.225
Emersol 210 Elaine	lb.	.1375	.1875
Groco 2, 4, 8, 18	lb.	.1375	.1875
Welcoline	lb.	.21	.42
Plastone	lb.	.27	.30
Polyac	lb.	1.85	
Ridacto	lb.	.25	.26
Seedine	lb.	.1485	.1703
Stearex Beads	lb.	.1488	.1588
Stearic acid			
Emersol 120	lb.	.1575	.1825
150	lb.	.185	.21
Hydrofoil 51	lb.	.09	
Hydrogenated, rubber grd.			
Groco 56	lb.	.115	.14
Rufat 75	lb.	.1062	.1325
Single pressed, comml.	lb.	.1475	.1675
Emersol 110	lb.	.1525	.1775
Groco 53	lb.	.1525	.1775
Wilmar 253	lb.	.1525	.1775
Double pressed, comml.	lb.	.1525	.1725
Groco 54	lb.	.1575	.1825
Wilmar 254	lb.	.1575	.1825
Triple pressed, comml.	lb.	.175	.195
Groco 55	lb.	.175	.20
Wilmar 255	lb.	.1875	.2075
Sterene 60-R	lb.	.09	.1075
Tonox	lb.	.54	.56
Vimbra	lb.	.32	.385
Vulklor	lb.	.88	.98
Wilmar 110	lb.	.17	.22
434	lb.	.1425	.1925
Zinc stearate, comml.	lb.	.39	.44

Antioxidants

AgeRite Alba	lb.	$2.40	$2.50
Gel	lb.	.70	.72
H. P.	lb.	.79	.81
Hipar	lb.	1.05	1.07
Powder	lb.	.57	.59
Resin	lb.	.88	.90
D	lb.	.57	.59
Spar	lb.	.57	.59
Stalite	lb.	.57	.59
S	lb.	.57	.59
Superlite	lb.	.57	.59
White	lb.	1.50	1.60
Akroflex C	lb.	.85	.87
CD	lb.	.79	.81
Albasan	lb.	.69	.73
Alcogard 354 Powder	lb.	1.50	1.52
Allied AA 1144	lb.	.23	.24
AA-1177	lb.	.155	.165
Aminox	lb.	.57	.59
Antioxidant 425	lb.	2.47	2.50
2246	lb.	1.50	1.53
Antisol	lb.	.23	.24
Antisun	lb.	.15	.51
Antox	lb.	.59	.61
Aranox	lb.	3.25	
Betanox Special	lb.	.94	.96
B-L-E, -25	lb.	.57	.59
Burgess Antisun Wax	lb.	.185	
B-X-A	lb.	.55	.60
CAO-1	lb.	.37	.86
-5	lb.	1.49	1.63
Copper Inhibiter X-872-L	lb.	2.01	
D-B-P-C	lb.	.91	1.16
Deenax	lb.	.95	
Flectol H	lb.	.57	.59
Flexamine	lb.	.79	.81
Heliozone	lb.	.31	.32
Ionol	lb.	.91	1.65
Microflake	lb.	.20	.24
Naugawhite	lb.	.57	.59
NBC	lb.	1.67	
Neozone A	lb.	.64	.66
C	lb.	.86	.88
D, Special	lb.	.57	.59
Nevastain A	lb.	.51	.61
B	lb.	.51	.70
Nonox CI	lb.	1.50	1.67
WSL	lb.	1.50	1.60
WSP	lb.	1.47	1.60
Octamine	lb.	.57	.59
PDA-10	lb.	.46	.48
Pennox A, C, D	lb.	.57	.59
B	lb.	.67	.69
Permalux	lb.	2.25	
Polygard	lb.	.57	.59
Polylite	lb.	.55	.60
Protector	lb.	.41	
Rio Resin	lb.	.70	.72
Santoflex			
75	lb.	1.01	1.03
AW	lb.	.71	.73
DD	lb.	.57	.59
Santovar A	lb.	1.55	1.57
Santowhite Crystals, Powd.	lb.	1.55	1.57
L	lb.	.57	.59
MK	lb.	1.25	1.27
Stabilite	lb.	.55	.59
Alba	lb.	.72	.79
L	lb.	.60	.64
White	lb.	.52	.60
Powder	lb.	.41	.47
Styphen I	lb.	.51	.55
Sunolite #100	lb.	.21	.23
#127	lb.	.17	.19
Sunproof-713	lb.	.26	.27
Improved	lb.	.25	.26
Jr.	lb.	.22	.23
Tenamene 3	lb.	.91	1.05
Thermoflex A	lb.	1.05	1.07
Tonox	lb.	.54	.59
Velvapex 51-250	lb.	.40	
V-G-B	lb.	.75	.80
Zalba	lb.	1.10	
Zenite	lb.	.52	.54

Antiozonants

Eastozone 30, 31	lb.	1.05	1.09
32	lb.	1.15	1.20
Flexone 3-C	lb.	2.00	
6-H	lb.	1.25	1.27
Nonox ZA	lb.	1.99	2.00
Santoflex AW	lb.	.71	.73
Tenamene 30, 31	lb.	1.24	1.28
Tysonite	lb.	.30	.307
UOP 88, 288	lb.	1.05	1.07
Wing-Stay S, T	lb.	.55	.67
100	lb.	1.00	1.08

Antiseptics

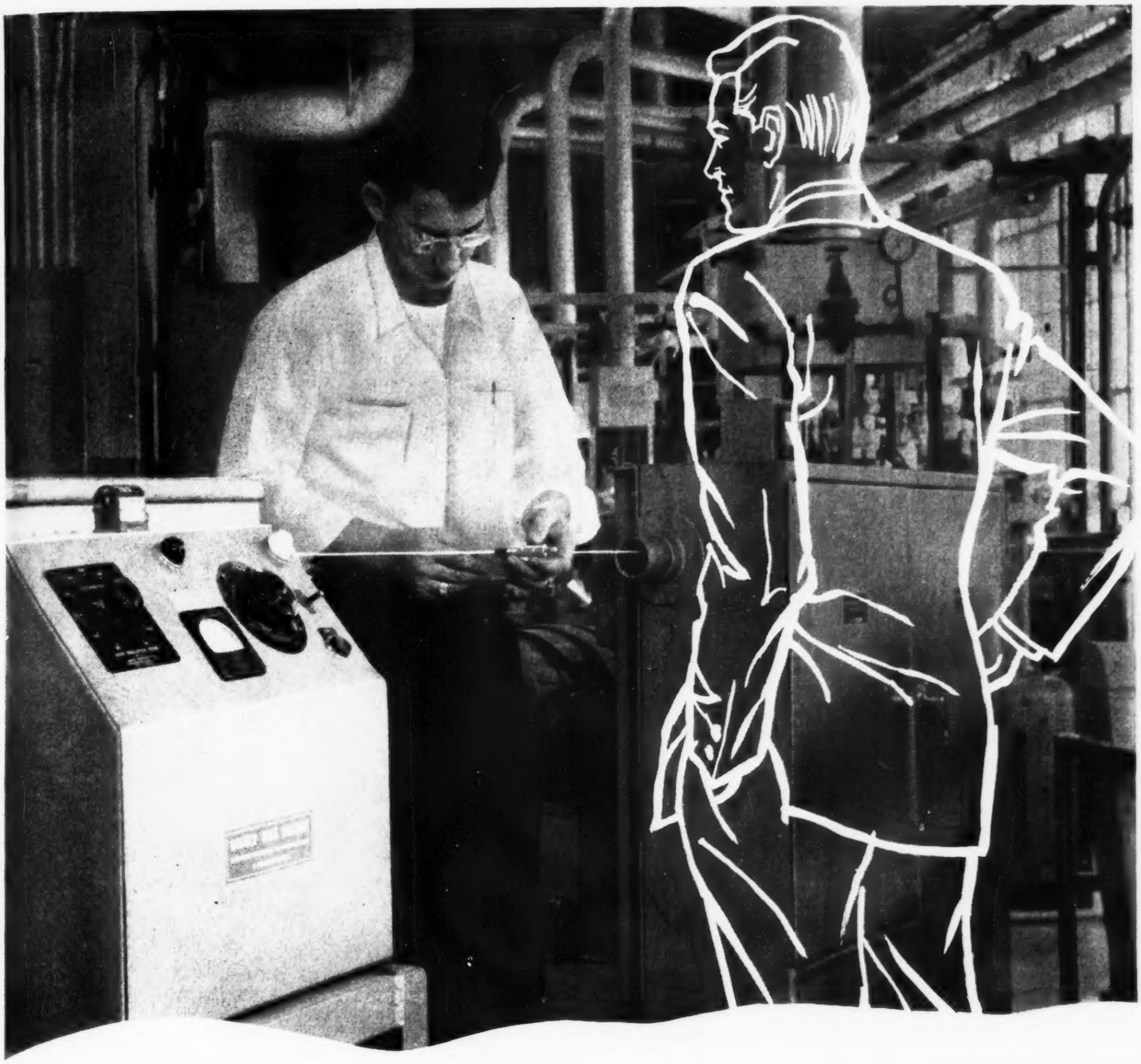
Copper naphthenate, 6-8%	lb.	.245	
Pentachlorophenol	lb.	.22	.30
Resorcinol, technical	lb.	.775	.785
Zinc naphthenate, 8-10%	lb.	.245	.30

Blowing Agents

Ammonium bicarbonate	lb.	.07	.09
Carbonate	lb.	.16	

* Prices, in general, are f.o.b. works. Range indicates grade or quantity variations. No guarantee of these prices is made. Spot prices should be obtained from individual suppliers.

† For trade names, see Color—White, Zinc Oxides.



TWO NEW SOLUTIONS FOR "HOT" WIRE PROBLEMS
...FROM YOUR SILICONES MAN

Two new low shrink silicone rubber insulating compounds . . . developed by the UNION CARBIDE Silicones Man . . . are now solving many of today's electrical wire and cable insulation problems. Offering good dielectric and physical properties with easy processing, they are ideal materials for air frame applications, motor truck wires, motor leads and hook-ups, small appliance wiring, and marine wiring.

UNION CARBIDE K-1347 Silicone Compound is a premium quality stock that meets tight military and industrial specifications. It has high green strength, remilling is easy, and it is readily colored for coding. Easily extruded, it provides a smooth, non-porous, high gloss surface, and can be braided without postcure. Physical properties are excellent using either steam or hot air cures.

For economy operations where good, but not premium, physical properties are needed, lower cost UNION CARBIDE K-1357 may well fill all requirements. Available precatalyzed in both slabs and coiled strips, it can be fed directly from carton to extruder on most equipment.

Both silicones have outstanding retention of tensile strength and elongation after prolonged exposure to high temperature. Both have dielectric strength of 1000 volts/mil. Both can be cured with either steam or hot air. And both are low shrink compounds. K-1347 . . . for premium properties. K-1357 . . . for economy.

For more information, write or call your UNION CARBIDE Silicones Man, or Dept. ES-9905, Silicones Division, Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. (*In Canada:* Bakelite Company, Division of Union Carbide Canada Limited, Toronto 7, Ontario.)

Unlocking the secrets of silicones

Rubber, Monomers, Resins, Oils and Emulsions

UNION CARBIDE SILICONES

"Union Carbide" is a registered trade-mark of UCC.

Blowing Agen t8110S	lb.	$0.32	/ $0.35
Celogen	lb.	1.95	
-80	lb.	1.60	
-AZ	lb.	1.92	
Kempore R-125	lb.	1.92	
Opex 40	lb.	.72	
PL-80	lb.	1.44	
Sodium bicarbonate	100 lbs.	2.55	/ 3.85
Carbonate, tech.	100 lbs.	1.35	/ 5.52
Sponge Paste	lb.	.20	
Unicel ND	lb.	.72	
NDX	lb.	1.44	
S	lb.	.20	
Vulcacel BN	lb.	1.36	/ 1.51
BMC	lb.	.68	/ .79

Bonding Agents

Braze	gal.	6.00	/ 9.00
Cover cement	gal.	2.50	/ 4.00
Chemlok 201, 203	gal.	5.00	/ 7.50
220	gal.	9.25	/ 12.00
401	gal.	11.70	/ 14.40
602	gal.	25.00	/ 26.00
607	gal.	18.00	
614	lb.	4.35	/ 4.75
Flocking Adhesive RFA17, RFA22, RFA25	lb.	.50	
G-E Silicone Paste SS-15	lb.	4.52	/ 5.10
SS-64	lb.	3.65	/ 6.75
-67 Primer	lb.	7.50	/ 12.50
Gen-Tac Latex	lb.	.70	/ .805
Hylene M	lb.	1.25	/ 2.75
M-50	lb.	.86	/ 2.36
Kalabond Adhesive	gal.	6.50	/ 16.00
Tie Cement	gal.	2.00	/ 5.60
Thixons	gal.	1.48	/ 12.00
Ty Ply, BN, Q, S, UP, 3640	gal.	6.75	/ 8.00
BC	gal.	4.50	/ 6.00
RC	gal.	3.75	/ 5.00

Brake Lining Saturants

BRT 3	lb.	.018	/ .0265
Resinex L-S	lb.	.0225	/ .03

Carbon Blacks‡

Conductive Channel—CC

Continental R-40	lb.	.26	/ .35
Kosmos/Dixie BB	lb.	.23	/ .30
Texas MC-74-BD	lb.	.26	/ .35
Voltex	lb.	.18	/ .315

Easy Processing Channel—EPC

Collocarb EPC	lb.	.059	/ .099
Continental AA	lb.	.0775	/ .155
Kosmobile 77/Dixiedensed 77	lb.	.074	/ .1225
Micronex W-6	lb.	.08	/ .1625
Spheron #9	lb.	.085	/ .1625
Texas E	lb.	.08	/ .1625
Witco #12	lb.	.0775	/ .155
Wyex EPC	lb.	.08	/ .1625

Medium Processing Channel—MPC

Arrow MPC	lb.	.08	/ .1625
Continental A	lb.	.0775	/ .155
Kosmobile S-66/Dixiedensed S-66	lb.	.0775	/ .145
Micronex Standard	lb.	.08	/ .1625
Spheron #6	lb.	.085	/ .1625
Texas M	lb.	.08	/ .1625
Witco #1	lb.	.0775	/ .155

Conductive Furnace—CF

Aromex CF	lb.	.0875	/ .155
Continex CF	lb.	.11	/ .17
Vulcan C	lb.	.110	/ .185
SC	lb.	.18	/ .255
XC-72	lb.	.25	/ .34

Fast Extruding Furnace—FEF

Arovel FEF	lb.	.0625	/ .135
Continex FEF	lb.	.0675	/ .135
Kosmos 50/Dixie 50	lb.	.06	/ .10
Philblack A	lb.	.0675	/ .135
Statex M	lb.	.0625	/ .135
Sterling SO	lb.	.0675	/ .135

Fine Furnace—FF

Statex B	lb.	.0675	/ .14
Sterling 99	lb.	.0725	/ .14

High Abrasion Furnace—HAF

Aromex HAF	lb.	.0725	/ .145
Continex HAF	lb.	.0775	/ .145
Kosmos 60/Dixie 60	lb.	.079	/ .1175
Philblack O	lb.	.0775	/ .145
Statex R	lb.	.0725	/ .145
Vulcan #3	lb.	.0775	/ .145

Intermediate Super Abrasion Furnace—ISAF

Aromex ISAF	lb.	.0875	/ .16
Continex ISAF	lb.	.0925	/ .16
Kosmos 70/Dixie 70	lb.	.10	/ .045
Philblack I	lb.	.0925	/ .16
Statex 125	lb.	.0875	/ .16
Vulcan 6	lb.	.0925	/ .16

General-Purpose Furnace—GPF

Arogen GPF	lb.	.055	/ .1275
Continex GPF	lb.	.06	/ .1275
Statex G	lb.	.055	/ .1275
Sterling V	lb.	.06	/ .1275
Non-staining	lb.	.06	/ .1275

High Modulus Furnace—HMF

Collocarb HMF	lb.	$0.045	/ $0.085
Continex HMF	lb.	.0625	/ .13
Kosmos 40/Dixie 40	lb.	.055	/ .095
Modulex HMF	lb.	.0625	/ .13
Statex 93	lb.	.0575	/ .13
Sterling L, LL	lb.	.0625	/ .13

Semi-Reinforcing Furnace—SRF

Collocarb SRF	lb.	.042	/ .082
Continex SRF	lb.	.0575	/ .125
Essex SRF	lb.	.0525	/ .125
Furnex	lb.	.0525	/ .125
Gastex	lb.	.0625	/ .135
Kosmos 20/Dixie 20	lb.	.0575	/ .0775
Pelletex, NS	lb.	.0575	/ .125
Regal	lb.	.0575	/ .125
Sterling NS, S	lb.	.0575	/ .125
R	lb.	.0625	/ .135

Super Abrasion Furnace—SAF

Philblack E	lb.	.115	/ .19
Statex 160	lb.	.11	/ .19
Vulcan 9	lb.	.115	/ .19

Fine Thermal—FT

P-33	lb.	.0575	/ .0625
Sterling FT	lb.	.0625	

Medium Thermal—MT

Sterling MT	lb.	.045	
Non-staining	lb.	.055	
Thermax	lb.	.04	/ .045
Stainless	lb.	.05	/ .055

Awaiting Classification

Regal 300	lb.	.0775	/ .145
600	lb.	.0925	/ .16

Colors

Black

Iron oxides, comml.	lb.	.1235	/ .135
BK—Lansco	lb.	.1275	/ .13
Williams	lb.	.145	
Lansco synthetic	lb.	.10	
Mapico pure synthetic	lb.	.1475	/ .15
Lampblack, comml.	lb.	.16	/ .45
Superjet	lb.	.085	/ .12
Permanent Blue	lb.	.80	/ 1.05
Stan-Tone	lb.	.45	/ 1.20
Vansul masterbatch	lb.	.60	/ .65
Paste	lb.	.14	/ .15

Blue

Alkali Blue G, R	lb.	2.38	
C. P. Iran Blues	lb.	.52	/ .54
Du Pont	lb.	2.55	/ 4.75
Filo	lb.	.28	
Heveatex pastes	lb.	.80	/ 1.45
Lansco ultramarines	lb.	.25	/ .28
Monsanto Blue 7	lb.	1.55	
11	lb.	3.45	
DPB-283	lb.	1.93	
S-11	lb.	2.05	
Permanent Blue	lb.	.80	/ 1.05
Solfast	lb.	1.60	/ 3.25
Stan-Tone Violet Blue			
D-4000	lb.	3.45	
4001	lb.	3.00	
4002	lb.	.90	
4900	lb.	1.97	/ 2.15
Vansul masterbatch	lb.	.90	/ 2.70

Brown

Filo	lb.	.13	
Iron oxides, comml.	lb.	.1425	/ .145
Lansco synthetic	lb.	.125	
Mapico Brown	lb.	.1575	/ .16
Sienna, burnt, comml.	lb.	.0425	/ .155
Williams	lb.	.115	/ .1775
Raw, comml.	lb.	.045	/ .1325
Williams	lb.	.08	/ .1725
Umber, burnt, comml.	lb.	.06	/ .07
Williams	lb.	.0725	/ .085
Raw, comml.	lb.	.0625	/ .07
Williams	lb.	.07	/ .0825
Williams, pure brown	lb.	.155	
Vandyke	lb.	.12	
Mapico Tan	lb.	.2325	/ .235
Metallic brown pure synthetic	lb.	.05	/ .06
Vansul masterbatch	lb.	2.10	/ 2.20

Green

Chrome	lb.	.42	/ .45
Green	lb.	.80	/ 2.40
Oxide	lb.	.3925	/ 1.10
Cyanamid	lb.	.42	/ .45
Green G	lb.	3.00	
Lincoln Green	lb.	5.30	/ 6.60
G-4099-6099	lb.	.4525	
GH-9869	lb.	1.10	/ 1.25
9976	lb.	1.20	/ 1.35
Du Pont	lb.	2.05	/ 2.80
Filo	lb.	.40	
Heveatex pastes	lb.	.95	/ 1.85
Lansco Toner	lb.	1.35	
Monsanto Green 3	lb.	2.75	
14	lb.	1.45	
17	lb.	3.95	
71205	lb.	1.35	
DGP	lb.	2.03	
S-17	lb.	2.25	

‡ At the request of the suppliers, the lowest prices shown for carbon blacks are for carloads in bags. Prices for hopper carloads are lower.

Permansa	lb.	$1.45	
Serene	lb.	3.50	
Solfast	lb.	1.60	/ $3.35
Stan-Tone			
D-5000	lb.	3.95	
5001	lb.	.82	
5400	lb.	1.50	
Vansul masterbatch	lb.	2.00	/ 2.60

Orange

Benzidine 12193	lb.	3.30	
Cyanamid Permatons	lb.	1.56	
Dianisidine 10406	lb.	2.85	
Du Pont	lb.	2.25	
Molybdate	lb.	.49	
Monsanto Orange 68187	lb.	2.90	
Stan-Tone			
Light orange 70 PCO3	lb.	2.48	/ 2.76
D-7003	lb.	3.97	/ 4.17
Orange 70 PCO4	lb.	2.80	/ 3.08
D-7004	lb.	4.23	/ 4.43
7104	lb.	1.85	/ 2.05
Vansul masterbatch	lb.	2.00	/ 2.60

Red

Antimony trisulfide	lb.	.285	/ .315
R. M. P. No. 3	lb.	.72	
Sulfur Free	lb.	.78	
Arcturus CP-1270	lb.	1.35	
Brilliant Toning Red	lb.	.77	/ 1.90
Cadmium red lithopones	lb.	2.21	/ 3.77
Cadmolith	lb.	1.72	/ 2.20
Cyanamid	lb.	.91	/ 2.00
Naphthol Red, Scarlet	lb.	2.95	/ 3.80
Du Pont	lb.	2.00	/ 2.05
Filo	lb.	.11	
Indian Red	lb.	.1275	
Iron oxide, comml.	lb.	.06	/ .13
Lansco synthetic	lb.	.1175	
Mapico pure synthetic	lb.	.1425	/ .145
Recco	lb.	.12	
Williams Red	lb.	.13	/ .1525
Lake Red C, CP-1104	lb.	1.25	
Monsanto Maroon 113	lb.	1.50	
61148	lb.	1.75	
Red 7	lb.	1.55	
41	lb.	4.40	
3501	lb.	1.15	
4004	lb.	1.50	
69191	lb.	3.38	
Autumn	lb.	1.10	
PRP-285	lb.	1.27	
S-44	lb.	1.28	
Plasticone	lb.	1.02	/ 4.60
Rub-Er-Red	lb.	.0975	
Solfast	lb.	1.60	/ 1.80
Stan-Tone			
70 PCO5	lb.	3.00	/ 3.28
D-2000	lb.	1.25	
2110, 2120, 2121	lb.	.98	
2200	lb.	1.47	
2500	lb.	1.90	
2600	lb.	4.60	
2601	lb.	1.60	
2700		1.75	
2800	lb.	1.90	
Light Red D-7005	lb.	4.68	/ 4.88
7105	lb.	1.97	/ 2.17
Red 70 PCO6	lb.	3.35	/ 3.63
D-7006	lb.	4.89	/ 5.09
-7106	lb.	2.20	/ 2.40
Vansul masterbatch	lb.	.95	/ 3.30
Venetian	lb.	.04	/ .0675

White

Antimony oxide	lb.	.27	/ .285
Burgess Iceberg	ton	50.00	/ 80.00
Cryptone BT	lb.	.10	/ .11
Permolith lithopone	lb.	.0825	/ .0912
Titanium pigments			
Horse Head Anatase	lb.	.255	/ .27
Rutile	lb.	.275	/ .29
Rayox LW	lb.	.195	/ .205
R-110	lb.	.215	/ .225
Ti-Cal	lb.	.075	/ .0825
Ti-Pure	lb.	.195	/ .225
Titanox A, AA, A-168	lb.	.255	/ .265
C-50	lb.	.1438	/ .1488
RA, -10, -50	lb.	.275	/ .285
RC	lb.	.0963	/ .1013
-HT, -HTX	lb.	.0963	/ .0988
Rutile	lb.	.205	/ .29
Unitane	lb.	.255	/ .29
Zopaque Anatase	lb.	.245	/ .27
Zinc oxide, comml.	lb.	.145	/ .1825
Azo ZZZ-11, -44, -55	lb.	.145	/ .155
12% leaded	lb.	.125	/ .135
35% leaded	lb.	.15375	/ .16375
50% leaded	lb.	.1575	/ .1675
Eagle AAA, lead free	lb.	.145	/ .155
5% leaded	lb.	.145	/ .155
35% leaded	lb.	.15375	/ .16375
50% leaded	lb.	.1575	/ .1675
Florence Green Seal	lb.	.1625	/ .1725
Red Seal	lb.	.1575	/ .1675
White Seal	lb.	.1675	/ .1775
Horsehead XX-4, -78	lb.	.145	/ .155
Kadox-15, -17, -72, -515	lb.	.145	/ .155
-25	lb.	.15	/ .16
Lehigh, 35% leaded	lb.	.15375	/ .16375
50% leaded	lb.	.1575	/ .1675
Protox-166, -167	lb.	.145	/ .155
St. Joe, lead free	lb.	.145	/ .175
Zinc sulfide, comml.	lb.	.253	/ .263
Cryptone ZS	lb.	.253	/ .263

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research · design · quality engineering

A production line of Francis Shaw 3-inch rubber extruders with centralised control. All Francis Shaw extrusion machines are designed for flexibility of application and consistency of product.

- **Francis Shaw Extruders serve every branch of the Rubber Industry.**
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- **Special Extruder Strainer Slabber designs.**
- **Complete extrusion lines engineered.**

Constant research and development, close co-operation with users, advanced design, selected high quality materials . . .
These coupled with long experience, help to create processing machinery of unrivalled performance.

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Telex: Canada Calender Hamilton 021/662

OVERSEAS AGENTS THROUGHOUT THE WORLD

P4396

Yellow

Benzidine 12199	lb.	$0.58	/ $2.55
Cadmium yellow lithopones	lb.	1.12	/ 1.15
Cadmolith	lb.	1.12	/ 1.20
Chrome	lb.	.135	/ .145
Cyanamid Hansa Yellow	lb.	2.20	
Du Pont	lb.	2.25	
Filo	lb.	.10	
Iron oxide, comml.	lb.	.0525	/ .1175
Lansco synthetic	lb.	.1075	
Mapico pure synthetic	lb.	.12	/ .1275
Williams	lb.	.115	/ .1225
Lightfast Benzidine 12220	lb.	3.40	
Monsanto Yellow 14	lb.	1.91	
10010	lb.	1.91	
BYP-282	lb	1.21	
GA	lb.	2.45	
S-10010	lb.	1.17	
Stan-Tone			
D-1100	lb.	2.55	
1101	lb.	.69	
Lemon 70 PCO1	lb.	1.77	/ 2.19
D-7001	lb.	2.80	/ 3.00
Medium yellow 70 PCO2	lb.	1.79	/ 2.21
D-7002	lb.	2.98	/ 3.18
Vansul masterbatch	lb.	.95	/ 1.95
Williams Ocher	lb.	.0575	/ .06

Dusting Agents

Antidust	lb.	.405	/ .445
Diatomaceous silica	ton	32.00	/ 48.00
Extrud-o-Lube, conc.	gal.	1.33	/ 1.69
Glycerized Liquid Lubricant, concentrated	gal.	1.25	/ 1.63
Glyso-Lube, #3	lb.	.14	
Latex-Lube GR	lb.	.20	
Pigmented	lb.	.1825	
R-66	lb.	.165	
Liqui-Lube	lb.	.1625	
N. T.	lb.	.1675	
Liquizinc No. 305	lb.	.30	/ .35
Lubrex	lb.	.25	/ .30
Mica 160 Biotite	lb.	.065	/ .0725
Mesh	lb.	.08	/ .0875
325 Mesh	lb.	.0825	/ .09
Concord	lb.	.08	/ .09
Mineralite	ton	45.00	
Pigmented Separex, LG	lb.	.105	
Slab-Dip, S-20	lb.	.11	/ .15
Pyrax A	ton	14.50	/ 15.00
W. A.	ton	17.00	/ 17.50
Rexanol	lb.	.13	
Talc, comml.	ton	18.40	/ 38.50
EM	ton	11.00	/ 63.00
LS Silver	ton	29.25	
Nytals	ton	28.00	/ 38.00
Sierra Sagger 7	ton	34.00	
White IR	ton	19.75	
III	ton	20.75	
Vanfre	gal.	1.95	/ 3.00
Wet-Zinc, CW, P	lb.	.20	/ .2225

Extenders

BRS 700	lb.	.02	/ .036
BRT 7	lb.	.035	/ .036
Cumar Resins	lb.	.095	/ .19
Dielex B	lb.	.06	
Factice, Amberex	lb.	.29	/ .36
Brown	lb.	.1425	/ .263
Neophax	lb.	.157	/ .268
White	lb.	.144	/ .285
G. B. Asphaltenes	lb.	.097	/ .177
Millex, W	lb.	.07	
Mineral Rubbers			
Black Diamond	ton	38.00	/ 40.00
Hard Hydrocarbon	ton	53.00	/ 60.00
Hydrocarbon MR	ton	45.00	/ 55.00
Parmr	ton	21.00	/ 29.00
T-MR Granulated	ton	47.50	/ 50.00
Nuba No. 1, 2	lb.	.0575	/ .0625
3X	lb.	.0775	/ .0825
OPD-101	lb.	.26	
Rubber substitute, brown	lb.	.16	/ .2572
Car-Bel-Ex A	lb.	.14	
Car-Bel-Lite	lb.	.35	
Extender 600	lb.	.1765	
White	lb.	.192	/ .2103
Stan-Shells	ton	35.00	/ 73.00
Sublac Resin PX-5	lb.	.215	/ .235
Sundex 53	gal.	.12	
85	gal.	.1725	
Synthetic 100	lb.	.41	
Vistanex L grades	lb.	.35	

Fillers, Inert

Agrashell flour	ton	50.00	/ 74.00
Albacar	ton	55.00	/ 75.00
Barytes, floated, white	ton	49.00	/ 70.85
No. 1	ton	55.00	/ 77.50
2	ton	50.00	/ 72.50
Off-color, domestic	ton	25.00	
Sparmite	ton	95.00	/ 117.00
Blanc fixe	ton	100.00	/ 165.00
Burgess HC-75	ton	12.00	/ 30.00
80	ton	14.00	/ 32.00
Iceberg	ton	50.00	/ 80.00
Pigment #20	ton	35.00	/ 60.00
#30	ton	37.00	/ 60.00
WP #1	ton	11.00	/ 16.00
Camel-Carb	ton	14.00	
-Tex	ton	22.00	
-Wite	ton	35.00	
Cary #200	ton	30.00	/ 55.00
Citrus seed meal	lb.	.04	
Oil	lb.	.15	

Note

Suppliers are requested to submit product additions or deletions and price changes promptly as they occur in order that we may make the listing of maximum service to our readers. Comments on the present listing and classifications are invited with a view toward facilitating location of specific items.

Correspondence should be directed to Market Editor, RUBBER WORLD, 630 Third Avenue, New York 17, New York.

Clays			
A. F. D. Filler	ton	$29.50	/ $36.00
Aiken	ton	14.00	
Albacar	ton	50.00	/ 55.00
Champion	ton	14.50	
Crown	ton	14.00	/ 33.00
Dixie	ton	14.50	/ 15.00
Franklin	ton	13.50	/ 35.25
GK Soft Clay	ton	11.00	
Harwick	ton	21.50	/ 77.00
Hi-White R	ton	10.00	/ 14.50
Hydratex R	ton	28.00	
Kaolloid	ton	10.50	
LGB	ton	13.00	/ 17.50
LGP	ton	15.50	/ 20.00
McNamee	ton	14.50	/ 15.00
RX-43	ton	33.00	
Natka 1200	ton	13.00	/ 36.00
Par	ton	13.00	/ 13.50
Paragon	ton	10.00	/ 14.50
Polyfil	ton	25.00	/ 65.00
Recco	ton	14.00	
Sno-Brite	ton	12.50	
Stan-Clay	ton	28.00	
Stellar-R	ton	50 00	
Suprex	ton	10.00	/ 14.50
Swanee	ton	12.50	
Windsor	ton	14.00	/ 30.00
DC Silica	lb.	1.15	/ 1.40
Diatomaceous silica	ton	32.00	/ 48.00
Flocks			
Cotton, dark	lb.	.095	/ .135
Dyed	lb.	.55	/ .60
White	lb.	.13	/ .33
Fabrifil X-24-G	lb.	.135	
X-24-W	lb.	.235	
Filfloc 6000	lb.	.33	
F-40-900	lb.	.135	
HSC #35 Silicone Emulsion	lb.	1.22	/ 2.46
Hydrite	ton	25.00	/ 50.00
Kalite	ton	52.50	/ 67.50
Lithopone, comml.	lb.	.075	/ .085
Eagle	lb.	.0725	/ .075
Permolith	lb.	.08	/ .0875
Sunolith	lb.	.075	/ .0825
Mica, 160 Biotite	lb.	.065	/ .0725
Mesh	lb.	.08	/ .0875
325 Mesh	lb.	.0825	/ .09
Concord	lb.	.08	/ .09
Millical	ton	38.00	/ 53.00
Mineralite	ton	40.00	/ 60.00
Non-Fer-Al	ton	35.00	/ 50.00
Ohio Superspray lime	ton	16.50	
Pulverized limestone, Stone-lite	ton	8.25	/ 11.00
Purecal	ton	56.75	/ 71.75
Pyrax A	ton	14.50	/ 15.00
W. A.	ton	17.00	/ 17.50
Sawdust	ton	14.00	/ 35.00
Silversheen Mica	lb.	.08	/ .09
Stan White	ton	10.50	/ 13.10
Super-White Silica	ton	25.00	/ 46.50
Surfex	ton	37.50	/ 52.50
MM	ton	42.00	/ 57.00
Suspenso	ton	38.00	/ 53.00
Ti-Cal	lb.	.0675	
Valron Estersil	lb.	2.00	/ 2.25
Walnut shell flours	ton	50.00	/ 84.00
Whiting, limestone			
Atomite	ton	32.50	/ 35.00
Calcite	ton	23.00	
Calwhite	ton	20.00	/ 27.00
-T	ton	23.00	
Duramite	ton	20.00	
Gamaco	ton	32.50	/ 40.00
Keystone	ton	20.00	/ 22.00
Laminar	ton	30.00	
No. 10 White	ton	11.00	/ 16.50
Omya	ton	30.00	
BSH	ton	45.00	
Paxinosa	ton	14.50	/ 22.50
Snowflake	ton	17.00	/ 18.00
Witco	ton	13.00	
York	ton	9.50	

Finishes

Apex Bright Finish #5200-E	lb.	.25	
Rubber Finish	gal.	2.50	
Black-out	gal.	4.50	/ 8.00
Flocks, Rayon, colored	lb.	$0.90	/ $1.50
White	lb.	.75	/ 1.25
Also see Flocks, under Fillers, Inert			
Paraflint RG and RGU Synthetic Wax	lb.	.15	/ .22
Rubber lacquer, clear	gal.	1.00	/ 2.00
Shellacs, Angelo	lb.	.485	/ .7325
Vac Dry	lb.	.485	/ .57
Talc *(See Talc, under Dusting Agents)*			
Unidip	lb.	.15	/ .20
Wax, Bees	lb.	.67	/ .83
Carnauba	lb.	.57	/ 1.13
Monten	lb.	.27	
Neutral	gal.	.76	/ 1.31
No. 118, colors	gal.	.86	/ 1.41
Van Wax	gal.	2.00	/ 2.05

Latex Compounding Ingredients

Acintol D, DLR	lb.	.0625	/ .085
FA #1	lb.	.0675	/ .09
#2	lb.	.0825	/ .105
Accelerator 552	lb.	2.25	
Accelerator J-117, -302	lb.	1.00	/ 1.15
-144	lb.	.15	/ .30
-307	lb.	1.10	/ 1.25
-311	lb.	.60	/ .75
Aerosol, dry types	lb.	.65	/ .80
Liquid types	lb.	.40	/ .75
Alcogard 354	lb.	1.40	/ 1.42
Alcogum AK-12	lb.	.12	/ .14
AN-6	lb.	.055	/ .06
-10	lb.	.09	/ .10
-25	lb.	.31	
PA-15	lb.	.16	
Alrosol	lb.	.41	
Amberex solutions	lb.	.1675	/ .18
Antifoam J-114	lb.	3.25	/ 3.45
P-242	lb.	.24	/ .35
Antioxidant J-137, -140	lb.	.55	/ .70
-139, -293	lb.	1.45	/ 1.60
-182	lb.	2.00	/ 2.15
-186	lb.	1.40	/ 1.55
2246	lb.	1.50	/ 1.53
Anti Webbing Agent J-183	lb.	.75	/ .90
-297	lb.	.27	/ .40
Aquablak B	lb.	.0975	/ .1025
G	lb.	.12	/ .125
K	lb.	.12	/ .125
M	lb.	.105	/ .11
Aquarex D	lb.	.85	
G	lb.	.21	
L	lb.	.94	
MDL	lb.	.35	
ME	lb.	.82	
Aquarex NS	lb.	.60	
SMO	lb.	.50	
WAQ	lb.	.22	
Ben-A-Gels	lb.	.98	1.40
Bentone 18, 18C	lb.	.45	
34	lb.	.60	
Casein	lb.	.22	
Cellosize WP-09, -3, -40, -300	lb.	1.00	/ 1.17
CW-12	lb.	.85	
-37	lb.	.70	
DC Antifoam A Compound	lb.	5.45	/ 6.65
B	lb.	.63	/ 1.10
Emulsion	lb.	2.05	/ 4.00
AF Emulsion	lb.	2.05	/ 2.85
Compound 7	lb.	5.13	/ 6.50
Defoama W-1701	lb.	.125	
Defoamer 115a	lb.	.50	
NDW	lb.	.215	/ .235
Dispersing Agents			
Blancol	lb.	.1525	/ .26
N	lb.	.155	/ .26
Darvan Nos. 1, 2, 3	lb.	.22	/ .30
Daxad 11, 21, 23, 27	lb.	.08	/ .30
Dispersaid H7A	lb.	.58	
1159	lb.	.43	
Emulphor ON-870	lb.	.50	/ .70
Igepal CO-630	lb.	.2875	/ .47
Igepon T-73	lb.	.285	/ .495
T-77	lb.	.45	/ .69
Indulins	lb.	.06	/ .08
Kreelons	lb.	.132	/ .155
Laurelton Oil	lb.	.13	
Leonil SA	lb.	.52	/ .65
Lomar PW	lb.	.13	
Marasperse CB	lb.	.1225	/ .1425
N	lb.	.095	/ .105
Modicols	lb.	.17	/ .58
Nekal BA-75	lb.	.395	/ .54
BX-76	lb.	.63	/ .75
Nopco 1287	lb.	.155	/ .195
Orzan A	lb.	.0325	
S	lb.	.0425	
Pluronics	lb.	.335	/ .40
Polyfons	lb.	.08	/ .09
Sorapon SF-78	lb.	.28	/ .40
Tergitol 7	lb.	.4125	/ .44
NPX	lb.	.275	/ .3074
TMN	lb.	.2875	/ .32
Trenmine W-30	lb.	.15	
W-40	lb.	.60	/ .75
Triton R-100	lb.	.12	/ .25
X-100, -102, -114	lb.	.255	/ .36
Dispersions			
Agebest 1293-22	lb.	1.90	/ 2.00
AgeRite Alba	lb.	3.00	
Powder, Resin D	lb.	.80	
White	lb.	1.80	
Altax	lb.	.75	
Shield No. 2, 6	lb.	.08	
3	lb.	.095	
4-35	lb.	.09	
5	lb.	.093	
7-F, 8	lb.	.165	
55	lb.	.18	

CLASSIFIED ADVERTISEMENTS

All Classified Advertising Must Be Paid in Advance

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GENERAL RATES	Light face type 20 cents per word. Bold face type 25 cents per word. Minimum $6.00.
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CONSULTANTS DIRECTORY	4 lines $10.00 per insertion.

Allow eight words for keyed address.

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ADDRESS ALL REPLIES TO NEW YORK OFFICE AT 630 THIRD AVENUE, NEW YORK 17, N. Y.

SITUATIONS WANTED

PLANT MANAGER. MUST RELOCATE. 22 YEARS' SOLID background in all phases of administration and manufacturing. Diversified and wide product lines. Successful proven record as administrator and in labor relations. Wish to associate with progressive and growing company. Address Box No. 2453, care of RUBBER WORLD.

TECHNICAL DIRECTOR. FACTORY MANAGER WISHES TO relocate with progressive, well-established organization. Chemical engineer with 25 years of diversified experience in laboratory, development, technical sales, production, management, and administration. Product experience covers all types of mechanicals, belting, hose, molded goods, camelback, extrusions, roll covering, tank lining, plastic hose, vinyl film, Rotocure products. Have an excellent record in labor relations; cost and production controls; product, process, and machine design; with ability to obtain results. Presently employed as Factory Manager, but will accept a responsible position with the right company. Write Box No. 2454, care of of RUBBER WORLD.

LATEX AND SOLVENT ADHESIVE CHEMIST DESIRES TO relocate. Two years' experience in development. Address Box No. 2455, care of RUBBER WORLD.

SENIOR COMPOUNDER: 23 YEARS OF AIRCRAFT. SPONGE, and tire development. Desires eastern technical position. Résumé. Address Box No. 2458, care of RUBBER WORLD.

GENERAL FOREMAN SEEKS PLANT SUPERINTENDENT position. Six years' experience in foam rubber and urethane products; thorough knowledge of compounding, molding, finishing, and shipping. Education—B.S. and M.B.A. Early 30's. Address Box No. 2459, care of RUBBER WORLD.

SITUATIONS OPEN

RAPIDLY GROWING AAA1 RUBBER COMPANY—ESTABLISHED over 100 years—New Management—have immediate need for Chemists and Production Men for branch plants and main factory operations—Locations: Midwest, Southwest, and West Coast. Excellent promotional possibilities. Experience in rubber or elastomers essential including educational background of Organic Chemistry or Chemical Engineering. Address Box No. 2450, care of RUBBER WORLD.

RUBBER ADHESIVE CHEMIST REQUIRED BY GROWING company with challenging problems in the molding of silicone, neoprene, and plastics and the bonding together of same. Plant located out of the smog near Palm Springs and the high desert. The company is modern, progressive, and has many employee benefits. Call or write: C. C. Douglas, C.E., The Deutsch Company, Electronic Components Div., Municipal Airport, Banning, California. VIctor 9-6701.

SALES SERVICE OPENINGS

Two openings in Borger, Texas, group. One requires 5-10 years' compounding experience in tires, tubes, and camelback. Other requires 5-10 years' compounding experience in sole, heel, and mechanical rubber goods. Benefits include contributory retirement, insurance, hospitalization. Send résumé and salary requirements to: J. M. HUBER CORPORATION, P.O. Box 831, Borger, Texas.

PRODUCTION ENGINEER

Unusual opportunity with a progressive company available for young graduate M.E. with experience in supervision of maintenance or heavy manufacturing operations. Familiarity with Plastics or Rubber processing desirable, but not essential. Salary no problem with the right man.

Send confidential résumé to:

Personnel Director
Apex Tire & Rubber Co.
505 Central Avenue
Pawtucket, Rhode Island

SITUATIONS OPEN (CONTINUED)

TECHNICAL SALES REPRESENTATIVE

This outstanding chemical sales organization serving the rubber industry offers excellent opportunity for graduate chemist or chemical engineer under 31 years of age having 5 to 7 years' diversified experience in rubber compounding and processing. Applications held in strict confidence. Send résumé to G. E. Popp, PHILLIPS CHEMICAL COMPANY, 318 Water Street, Akron 8, Ohio.

MACHINERY & SUPPLIES WANTED

GOOD USED 6-INCH X 12-INCH LABORATORY TWO-ROLL mill. State manufacturer, horsepower, accessories, location, and price. Write—American Lacquer & Solvents Co. of Florida, Box 11515, Tampa 10, Fla., Att. Mr. J. C. Osten.

MACHINE WANTED: NO. 9 BANBURY, CORE SIDES. Address reply to P.O. Box No. 2452, care of RUBBER WORLD, giving detailed information including price.

WANT TO BUY: USED MILLS, CALENDERS, TUBERS, PRESSES. No dealers, please. HOUSTON RUBBER MACHINE COMPANY. 3301 Jensen Drive, Houston 26, Texas.

WANTED: SMALL 4-ROLL INVERTED "L"-TYPE CALENDER with rolls of 8 to 16" face width, complete with drive, motor, and controls for 440-volt, 3-phase 60-cycle current. Send offerings to LA CROSSE RUBBER MILLS CO., P. O. Box 852, La Crosse, Wisconsin.

MACHINES WANTED: BANBURY MIXER WITH MOTOR (for cash). Also, Mooney Viscometer. Address Box No. 2460, care of RUBBER WORLD.

MACHINERY & SUPPLIES FOR SALE

—FOR SALE—

4—Blaw Knox 6' x 40' Horizontal Vulcanizers with quick-opening doors, 250# working pressure, ASME.
2—Royle #½ Extruders, complete.
1—Peerless Guillotine Cutter, 30" blade, with motor.
1—Allen 4" Extruder with 25 HP motor.
Address Box No. 2451, care of RUBBER WORLD.

FOR SALE: REBUILT BAKER-PERKINS 100-GALLON DOUBLE-arm, sigma-blade mixer, stainless-steel lining, solid stainless-steel sigma blades, motor driven. IRVING BARCAN COMPANY, 249-51 Orient Avenue, Jersey City 5, N. J., DElaware 2-6695-6.

FOR SALE: BAKER PERKINS DBL.-ARM MIXERS, JACKETED, **200-, 150-, 100-, 50-gal. capacity. Ross 3-roll hi-speed mill, 6" x 14". Stainless resin kettles,** condensers, etc. PERRY EQUIPMENT CORP., 1424 N. 6th St., Phila. 22, Pa.

FOR SALE: 1—10" x 18"—4-ROLL FARREL CALENDER: 1—14" x 30" Farrel-Birmingham Uni-Drive mill; 4—24" x 24" hydraulic presses, 12" rams; 1—6" x 16" Thropp 2-roll mill. CHEMICAL & PROCESS MACHINERY CORP., 52 9th Street, Brooklyn 15, N. Y. HY 9-7200.

MACHINERY — ALBERT REBUILT

ANYTHING AND EVERYTHING

P. E. ALBERT & SON
21 NOTTINGHAM WAY TEL. EX. 4-7181
TRENTON, N. J.

Dispersions (*Cont'd*)

Iron Oxide, 60%	lb.	$0.40
L.S.W.	lb.	1.50
No. 305 Liquizinc	lb.	.30 / $0.35
P-33	lb.	.35
Rotax	lb.	.75
Sulfur	lb.	.13 / .15
Telloy	lb.	3.62
Tuads, Methyl	lb.	1.60
Vulcacure NB	lb.	.45
NS	lb.	.75 / 1.05
T.M.D.	lb.	1.14
ZB, ZE, ZM	lb.	.85 / .89
Vulcanizing, C group	lb.	.40 / 1.30
G group	lb.	.45 / .90
N group	lb.	.40 / 1.00
Zetax	lb.	.75
Zimates, Butyl	lb.	1.30
Ethyl, Methyl	lb.	1.35
Zinc oxide	lb.	.40
Emulsions		
AgeRite Spar	lb.	1.00
Stalite	lb.	.75
Superlite	lb.	1.00
Borden Arcco A-25, A-26, 716-30	lb.	.18 / .19
555-40R	lb.	.185 / .205
620-32B	lb.	.20 / .21
716-35	lb.	.17 / .18
1041-21	lb.	.165 / .175
Habuco Resin Nos. 502, 515, 523	lb.	.195 / .20
503	lb.	.22 / .225
504, 526	lb.	.19 / .195
517	lb.	.175 / .18
524	lb.	.155 / .16
Resin A-2	lb.	.16 / .25
P-370	lb.	.175 / .25
X-210	lb.	.12 / .22
Freeze-Stabilizer 322	lb.	.40
12116C	lb.	.52
Hyonic PE 250	lb.	.255 / .295
Igepon T-43	lb.	.145 / .35
T-51	lb.	.125 / .285
-73	lb.	.285 / .495
Ludox	lb.	.1675/ .195
Marmix	lb.	.41 / .48
Merac	lb.	.75 / 1.05
Micronex, colloidal	lb.	.06 / .072
Modical S	lb.	.3084/ .3284
VD	lb.	.1384/ .1584
Monsanto Blue 4685 WD	lb.	1.60
Green 4884 WD	lb.	1.80
Red 127	lb.	1.25
OPD 101	lb.	.16 / .26
Picco Latex Plasticizer A-12	lb.	.069 / .096
Pliolite Latex 150, 190	lb.	.32 / .41
170	lb.	.37 / .46
Polyvinyl methyl ether	lb.	.25 / .45
Resin V	lb.	.13
Roelgel 100C	lb.	.46
Santomerse #3 Paste	lb.	.26 / .30
Sellogen Gel	lb.	.1275
Sequestrene AA	lb.	.905 / .975
ST	lb.	.585 / .615
30A	lb.	.245 / .265
Setsit #5	lb.	.75 / 1.05
#9	lb.	.85 / 1.15
Stablex A	lb.	.80 / 1.10
B, G	lb.	.50 / .95
K	lb.	.27 / .35
P	lb.	.35 / .50
T	lb.	.14 / .22
Surfactol 13	lb.	.345 / .36
Vult-Accel E	lb.	.85 / .92
Webnix	lb.	1.50 / 2.50

Mold Lubricants

A-C Polyethylene	lb.	.30 / .47
Acintol D	lb.	.0625/ .085
Alipal CO-433	lb.	.25 / .45
CO-436	lb.	.22 / .41
Aquarex Compounds	lb.	.21 / .94
Carbowax 200, 300, 400	lb.	.22 / .25
1500	lb.	.225 / .2825
4000	lb.	.31 / .32
6000	lb.	.35 / .36
Castorwax	lb.	.3375/ .3575
Colite Concentrate	gal.	.90 / 1.15
D-Tak Dip #10	gal.	1.50
DC Mold Release Fluid	lb.	3.14 / 4.75
200 Fluid	lb.	3.14 / 4.75
Compound 4, 7	lb.	5.13 / 6.50
Emulsion 7	lb.	1.20 / 1.74
8, 35, 35A, 35B, 36	lb.	1.20 / 1.74
ELA	lb.	.82
FT Wax 200	lb.	.265 / .42
300	lb.	.295 / .45
Glycerized Liquid Lubricant, concentrated	gal.	1.25 / 1.63
Igepals	lb.	.2875/ .74
Igepon AP-78	lb.	.44 / .68
T-43	lb.	.145 / .35
-51	lb.	.125 / .285
-73	lb.	.285 / .495
L-41 Diethyl Silicone Oil	lb.	3.50
Lubrex	lb.	.27 / .32
Lubri-Flo	gal.	10.00 / 12.05
Lustermold	lb.	.41
Mold Lubricant No. 426	lb.	.18
Paste	lb.	.25
Monopole Oil	lb.	.16
Monten Wax	lb.	.57
MR-22	gal.	9.95 / 14.95
Para Lube	lb.	0.46 / .048
Paraflint RG and RGU Synthetic Wax	lb.	.15 / .22

Plaskon 8406, 8407	lb.	$0.30 / $0.37
8416, 8417	lb.	.35 / .42
8429	lb.	.40 / .47
Pluronics	lb.	.335 / .44
Poly-Brite PE-20	lb.	.28 / .42
600	lb.	.42 / .58
Poly-Cone 125X	lb.	1.20 / 1.40
1000	lb.	.93 / 1.06
Polyglycol E series	lb.	.29 / .42
RA-1, -2, -3	gal.	2.25 / 3.00
Rubber Glo	gal.	.94 / .97
Silrex S-1	lb.	.65
SM-33, -55, -61, -62	lb.	1.22 / 1.76
Soap, Hawkeye	lb.	1.25 / 1.45
Purity	lb.	.155 / .165
Sodium stearate	lb.	.40
Stoner's 700 series	gal.	1.20 / 1.25
800 series	gal.	1.26 / 1.70
900 series	gal.	1.55 / 2.55
A series	gal.	1.80 / 4.50
Ucon 50-HB Series	lb.	.25 / .375
Ulco	lb.	.12 / .23
Vanfre	gal.	1.95 / 3.00

Odorants

Alamasks	lb.	.75 / 6.50
Coumarin	lb.	2.95 / 3.55
Ethavan	lb.	6.75 / 7.35
Latex Perfume #7	lb.	4.00
Neutroleum Gamma	lb.	3.60
Rodo	lb.	4.00 / 5.50
Rubber Perfume #10	lb.	2.60
Vanillin, Monsanto	lb.	3.00 / 3.15

Plasticizers and Softeners

Acintol DLR	lb.	.0625/ .085
Adipol 2EH, 10A, XX	lb.	.40 / .425
BCA	lb.	.45 / .475
ODY	lb.	.40 / .425
Admex 710	lb.	.3325/ .3625
711	lb.	.3325/ .3825
744	lb.	.3925/ .3825
Aro Lene #1980	lb.	.10 / .12
Baker AA Oil	lb.	.195 / .24
Crystal O Oil	lb.	.21 / .255
Processed oils	lb.	.215 / .235
Bardol, 639	lb.	.0275/ .0375
B	lb.	.055 / .065
Benzoflex 2-45	lb.	.26 / .29
9-88	lb.	.27 / .30
Bondogen	lb.	.555 / .605
BRC-20	lb.	.022 / .0245
22	lb.	.026 / .0285
30	lb.	.0165/ .025
521	lb.	.023
BRH 2	lb.	.0341/ .0351
BRS 700	lb.	.036
BRT 7	lb.	.035 / .036
BRV	lb.	.0625/ .065
Bunarex Liquid	lb.	.0425/ .0555
Resins	lb.	.085 / .095
Bunatak AH	lb.	.085 / .095
N	lb.	.31
U	lb.	.175
83	lb.	.0685
90	lb.	.09
210	lb.	.14
Bunnatol G, S	lb.	.40 / .505
Butac	lb.	.1735/ .1835
Butyl stearate, comml.	lb.	.255
B-17	lb.	.22 / .26
Binney & Smith	lb.	.23 / .26
Harchem	lb.	.2525/ .3425
Kessoflex	lb.	.245 / .275
Ohio-Apex	lb.	.26 / .27
Butyl stearate—G.P.	lb.	.0125/ .02
R-100	lb.	.045 / .0525
TT	lb.	.017 / .02
Califlux 510, 550	lb.	.0275/ .0375
G.P.	lb.	.015 / .0225
R-100	lb.	.0475/ .0575
T-T	lb.	.019 / .0295
Capryl alcohol, comml.	lb.	.195 / .30
Columbian Carbon	lb.	.195 / .30
Harchem	lb.	.195 / .30
Chlorowax 40	lb.	.1625/ .1825
70	lb.	.185 / .245
-S	lb.	.21 / .27
Circo light	gal.	.17
Circosol-2XH	gal.	.185
Contogums	lb.	.0875/ .111
Cumar Resins	lb.	.065 / .17
DBM (dibutyl-m-cresol) Darax	lb.	.32 / .3475
DBP (dibutyl phthalate), comml.	lb.	.26 / .40
Darex	lb.	.30 / .33
Eastman	lb.	.26 / .30
Harflex 140	lb.	.275 / .315
Harwick Std. Chem. Co.	lb.	.325 / .385
Hatco	lb.	.30 / .33
Monsanto	lb.	.26 / .30
Naugatuck	lb.	.30 / .33
PX-104	lb.	.26 / .30
Rubber Corp. of America	lb.	.275 / .43
Sherwin-Williams	lb.	.30 / .33
DBS (dibutylsebacate) comml.	lb.	.66 / .69
Eastman	lb.	.655 / .685
Harflex 40	lb.	.655 / .685
Hatco	lb.	.66 / .685
Monoplex	lb.	.66 / .675
Naugatuck	lb.	.665 / .69
PX-404	lb.	.665 / .685
DCP (dicaprylphthalate), comml.	lb.	.295 / .325
Harflex 180	lb.	.26 / .30
Hatco	lb.	.295 / .325
Monoplex	lb.	.30 / .315
DDA (didecyladipate)		
Good-rite GP-236	lb.	$0.40 / $0.59
Kessoflex	lb.	.40 / .435
DDP (didecylphthalate)		
Good-rite GP-266	lb.	.295 / .45
Hatco	lb.	.305 / .435
Defoamer X-3	lb.	.355
DIBA (diisobutyladipate)		
Darex	lb.	.4325/ .4625
Eastman	lb.	.40 / .44
Ohio-Apex	lb.	.41 / .435
DIDA (diisodecyladipate)		
Monsanto	lb.	.40 / .44
RC	lb.	.40 / .44
DIDP (diisodecylphthalate)		
Darex	lb.	.32 / .35
Harflex 110	lb.	.265 / .305
Monsanto	lb.	.26 / .30
Ohio-Apex	lb.	.26 / .30
PX-120	lb.	.26 / .30
RC	lb.	.265 / .305
Dielex B	lb.	.06
Diethylene glycol, comml.	lb.	.1525/ .1825
Wyandotte	lb.	.15 / .165
Di-2 ethylhexyl azelate	lb.	.455 / .495
Dinopol IDO	lb.	.285 / .32
DIOA (diisooctyladipate)		
Kessoflex	lb.	.40 / .435
Naugatuck	lb.	.435 / .465
PX-208	lb.	.40 / .435
Rubber Corp. of America	lb.	.40 / .44
DIOP (diisooctylphthalate), comml.	lb.	.305 / .335
Darex	lb.	.32 / .35
Eastman	lb.	.25 / .29
Harflex 120	lb.	.26 / .30
Hatco	lb.	.305 / .335
Monsanto	lb.	.25 / .29
Naugatuck	lb.	.305 / .335
Ohio-Apex	lb.	.25 / .29
PX-108	lb.	.26 / .30
Rubber Corp. of America	lb.	.26 / .30
Sherwin-Williams	lb.	.32 / .34
DIOS (diisooctylsebacate), comml.	lb.	.61 / .64
Rubber Corp. of America	lb.	.5925/ .6325
DIOZ (diisooctylazelate)		
Cabflex	lb.	.48 / .51
Dipolymer Oil	gal.	.33 / .48
Dispersing Oil No. 10	lb.	.06 / .0625
DNODA (di-n-octyl-n-decyl adipate), Monsanto	lb.	.40 / .44
DOA (dioctyladipate), comml.	lb.	.425 / .455
Eastman	lb.	.40 / .44
Good-rite GP-233	lb.	.40 / .55
Harflex 250	lb.	.40 / .435
Hatco	lb.	.435 / .465
Monsanto	lb.	.40 / .44
Naugatuck	lb.	.435 / .465
PX-238	lb.	.40 / .435
Rubber Corp. of America	lb.	.40 / .44
DOP (dioctylphthalate), comml.	lb.	.305 / .335
Darex	lb.	.32 / .35
Eastman	lb.	.26 / .30
Good-rite GP-261	lb.	.285 / .44
Harflex 150	lb.	.26 / .30
Hatco	lb.	.305 / .335
Monsanto	lb.	.25 / .29
Naugatuck	lb.	.305 / .335
Ohio-Apex	lb.	.25 / .29
Polycizer 162	lb.	.28 / .435
PX-138	lb.	.25 / .29
Rubber Corp. of America	lb.	.25 / .30
Sherwin-Williams	lb.	.305 / .335
DOS (dioctylsebacate) comml.	lb.	.61 / .64
Eastman	lb.	.61 / .64
Harflex 50	lb.	.5925/ .6225
Hatco	lb.	.61 / .635
Monoplex	lb.	.61 / .635
Naugatuck	lb.	.615 / .64
PX-438	lb.	.5925/ .6225
Rubber Corp. of America	lb.	.5925/ .6325
Drapex 3.2	lb.	.40 / .54
Dutch Boy NL-A10 (DBP)	lb.	.30 / .33
-A20 (DOP), A30 (DIOP)	lb.	.305 / .335
-A54	lb.	.295 / .325
-C20 (DOS)	lb.	.61 / .63
-F21	lb.	.395 / .425
-F31	lb.	.44 / .47
-F41	lb.	.48 / .51
Dutrex 6	lb.	.025 / .035
Dymerex Resin	lb.	.135 / .1475
Elastex 36-R	lb.	.43 / .4625
37-R	lb.	.70 / .71
Emulphor EL-719	lb.	.52 / .73
Endor	lb.	.67
Ethox	lb.	.43 / .455
Ethylene glycol, comml.	lb.	.135 / .165
Wyandotte	lb.	.1325/ .142
Flexol 3 GH	lb.	.44 / .46
3 GO	lb.	.53 / .55
4 GO	lb.	.325 / .355
10-A	lb.	.425 / .455
426	lb.	.27 / .30
810, 810X, 10-10, 10-10X	lb.	.305 / .335
TPF, A-26	lb.	.435 / .465
Flexricin P-4	lb.	.3475/ .362
P-6	lb.	.415 / .43
Flexricin P-8	lb.	.3475/ .362
PG-16	lb.	.335 / .35
Fortex	lb.	.125 / .145
Fura-Tone NC 1008	lb.	.28
1012	lb.	.46
G. B. Asphaltic Flux	gal.	.097 / .177
Naphthenic Neutrals	gal.	.125 / .215

MACHINERY & SUPPLIES FOR SALE (CONTINUED)

—FOR SALE—

2—16" x 42" Farrel mills.
1—15" x 40" 3-roll calender
HOUSTON RUBBER MACHINE COMPANY
3301 Jensen Drive, Houston 26, Texas

CHOICE EQUIPMENT—PRICED RIGHT

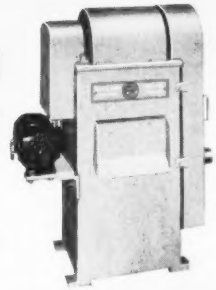
MILLS: Lab. 2-Roll 6" x 12" Compl., F-B. unused 14" x 30" with Uni-Drive, F-B. 18" x 42" and 22" x 60", others; **CALENDERS:** 2-roll 12" x 24"—15 HP, 3-Roll 22" x 60" complete. **MIXERS:** B-P 150-Gal. Dispersion, Compression cover good for 150 HP; others to 300 Gal. **EXTRUDERS: NRM** 1½" Jacketed, Vari-Speed, Royle 2" Jktd. MPM 4½" Elec. Htd. 40 HP, VS, Hydraulic Strainer with 2-20" Dia. Barrels. **VULCANIZERS:** 2 Adamson 6' x 16' ASME. **PRESSES:** Stewart-Bolling 22" Ram; 36" x 36", 6 Southwark 14" Ram with 36" x 36" platens; 2 Dunning-Boschert 12" Ram, 48" Daylight; Paterson-Kelley Stainless-Steel Twin-Shell Blenders, 30 cu. ft. and 150 cu. ft. NEW FALCON Ribbon Blenders; all sizes. J. H. Day 40-Gal. Pony Mixers, motorized. Utility Rubber Stock Cutter, Vari-Speed. **LIQUIDATION:** Foam Latex Plant, complete. FIRST MACHINERY CORP., 209-289 Tenth St., Bklyn. 15, N. Y., ST. 8-4672.

4—NEW FARREL-BIRMINGHAM 14" x 30" TWO-ROLL MILLS. Farrel 16" x 40" two-roll mill. Other sizes up to 60". Hydraulic Presses, 300-ton upstroke 40" x 30". 300-ton upstroke 22" x 35". 240-ton upstroke with ten 24" x 56" platens. 200-ton Farrel 30" x 30". 150-ton Farrel 24" x 24" and other sizes. Adamson 6" Rubber Extruder, New and used Laboratory 6" x 13", 6" x 16", and 8" x 16" Mills and Calenders. Baker-Perkins and Day heavy-duty Jacketed Mixers up to 200 gallons. Hydraulic pumps and accumulators. Rotary Cutters. Banbury Mixers, Crushers, Churns, Tubers, Vulcanizers, Bale Cutters, Gas Boilers, etc. SEND FOR SPECIAL BULLETIN. WE BUY YOUR SURPLUS MACHINERY. STEIN EQUIPMENT COMPANY, 107—8th STREET, BROOKLYN 15, NEW YORK. STERLING 8-1944.

ERIE 84" RUBBER MILL, TOP CAP, LATE TYPE, A REAL BUY! 600-Ton Adamson Slab Side 8-Opening Hydraulic Press, 42" x 42" Platen, 26" chrome-plated ram. Vaughn 18" x 40" 4-Roll "L"-Type Calender with motor and Reduction Drive. Black Rock Guillotine Cutter with 14" Knife. Allen 6" Rubber Tuber with strainer head. 24" x 24" Molding Presses with 12", 14", and 16" rams. A full line of equipment for the Rubber Industry: Banbury Mixers, Tubers, Rubber Mills, Molding Presses, Die Cutting Presses, Accumulators, Vulcanizers, etc., etc. Write for brochure on our new 6" x 13" Rubber Lab Mill. We will finance. JOHNSON MACHINERY COMPANY, 683 Frelinghuysen Avenue, Newark 12, New Jersey. BIgelow 8-2500.

BLACK ROCK

Rubber Band Cutter



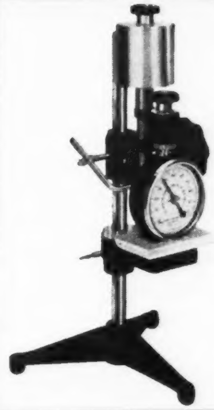
With one single setup you can cut infinitely variable band widths —from 1/16" to 1"— Adjustments can be made while your machine is in operation—600 to 800 cuts per minute.

COMPLETE LINE OF MACHINERY AND EQUIPMENT

WRITE TODAY

FINE BR TOOLS

BLACK ROCK MFG. CO.
179 Osborne Street • Bridgeport 5, Connecticut
NEW YORK OFFICE: 261 BROADWAY



RUBBER HARDNESS

ORIGINAL SHORE

DUROMETER

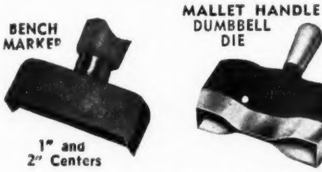
ASTM D676 AND ASTM D1484

Various models for testing the entire range of hardness from elastomeric to rigid. Available in quadrant or round dial case. May be used free hand or on table top OPERATING STAND WITH DEAD WEIGHT (left).

THE SHORE INSTRUMENT & MFG. CO., INC.
90-35 VAN WYCK EXP., JAMAICA 35, N.Y.

HOGGSON

"DUMBBELL" Test Strip Die D412(51T)



BENCH MARKER

MALLET HANDLE DUMBBELL DIE

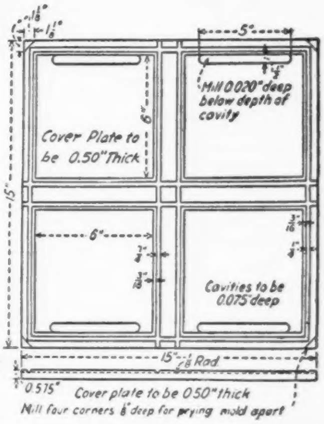
1" and 2" Centers

TOOLS, MOLDS, DIES

For Rubber Testing and Production

For making tensile test samples, we make many types of slab molds. One is detailed at the right. These are plain or chrome finished. We usually stock molds for making adhesion, abrasion, flexing, compression and rebound test samples, but supply special molds promptly. We also furnish hand-forged tensile dies for cutting regular or tear test samples.

SLAB→ MOLD D15-55



HOGGSON & PETTIS MFG. CO., 141S Brewery St., New Haven 7, Conn.
Pac. Coast: H. M. Royal, Inc., Downey, Calif.

A-ONE USED HYDRAULIC PRESSES—FOR SALE

Tons	Make	Up or Down	Ram	Stroke	Side to Side Opening	Table F to B	Day-light	Accessories
2760	Farrel	Up	24-14"	24"	52"	31 ft.	2-12"	Belt clamp & stretcher
2500	W-S	Down	36"	38"	56"	60"	96"	2 lead pots, dies,etc.
1350	Adamson	Up	2-24"	24"	60"	64"	40"	Frame only
570	Southwark	Up	2-22"	36"	72"	36"	74½"	Frame only
500	Southwark	Up	28"	24"	84"	70"	94"	Frame only
475	HPM	Down	22"	18"	48"	48"	30"	3½" push backs
400	Farrel	Up	4-10"	18"	48"	48"	43"	Frame only
400	Bolling	Up	18"	28"	30"	26"	28"	Frame only

Any of these presses can be reworked within their respective ranges to suit requirements. Some pumping equipment available. All dismantled at Cleveland. Bargain prices; prompt shipment while they last.

STEWART BOLLING & CO., INC. 3190 East 65th St., CLEVELAND 27, OHIO • Phone MIchigan 1-2850

G. B. Process oil, light	lb.	$0.0275	$0.0375
Medium	lb.	.0375	.0475
Galex W-100	lb.	.155	.18
W-100 D	lb.	.1525	.1775
Gilsowax B	lb.	.0975	.11
Harchemex	lb.	.24	.285
Harflex 300	lb.	.58	.615
325	lb.	.4325	.46
375	lb.	.7425	.83
500	lb.	.315	.41
HB-20	lb.	.15	.185
-40	lb.	.19	.23
Heavy Resin Oil	lb.	.0225	.0375
HSC-13	lb.	.25	.32
-39	lb.	.22	.29
Hycar 1312	lb.	.60	
Kapsol	lb.	.33	.355
Kenflex A, L	lb.	.26	.27
B	lb.	.23	.24
N	lb.	.18	.19
Kessoflex 103	lb.	.405	
105	lb.	.3325	
106	lb.	.38	
107	lb.	.525	
110	lb.	.24	
111	lb.	.28	
KP-23	lb.	.325	.335
-90	lb.	.40	.435
-140	lb.	.46	.485
-201	lb.	.45	.465
-260	lb.	.34	.375
Kronisol	lb.	.35	.385
Kronitex AA, I, K-3, MX	lb.	.325	.36
LX-685, -125, -135	lb.	.125	.135
Marvinol plasticizers	lb.	.28	.8825
Methox	lb.	.385	.41
Millrex	lb.	.15	
Monoplex S-38	lb.	.215	.24
S-71	lb.	.45	.475
Morflex	lb.	.25	.65
Natac	lb.	.1685	.1785
Neoprene Peptizer P-12	lb.	1.05	
Nevillac	lb.	.31	.85
Neville R Resins	lb.	.145	.205
Nevinol	lb.	.24	
No. 1-D heavy oil	lb.	.065	
NP-10	lb.	.44	.48
ODA (octyldecyladipate)			
Good-rite GP-235	lb.	.40	.55
Kessoflex	lb.	.40	.435
RC	lb.	.40	.44
ODP (octyldecylphthalate)			
Good-rite GP-265	lb.	.29	.445
Hatco	lb.	.305	.335
Rubber Corp. of America	lb.	.265	.305
Ohopex Q-10	lb.	.265	.305
R-9	lb.	.3525	.3775
Orthonitro benzophenol, comml.	lb.	.13	.15
Palmalene	lb.	.15	
Panaflex BN-1	lb.	.185	.225
Panarez Resins	lb.	.09	.14
Para Flux, regular	gal.	.10	.2125
No. 2016	gal.	.165	.24
2332	gal.	.11	
4205	lb.	.1075	.2125
ParaLube	lb.	.46	.48
Resins	lb.	.04	.045
Paradene Resins	lb.	.07	.08
Paraplex 5-B	lb.	.29	.3475
Al-111	lb.	.32	.3275
G-25	lb.	.76	.77
-40	lb.	.4825	.51
-50	lb.	.39	.4175
-53	lb.	.4325	.46
-60	lb.	.325	.35
-62	lb.	.345	.37
RG-7	lb.	.33	.335
-8	lb.	.505	.5125
-10	lb.	.52	.5275
Pepton 22	lb.	.83	.86
65	lb.	1.23	1.26
65-B	lb.	.83	.86
Philrich 5	gal.	.125	
Picco Resins	lb.	.09	.17
480 Oilproof Series	lb.	.18	.23
Aromatic Plasticizers	lb.	.07	.09
Liquid Resin D-165 (Y)	lb.	.06	.075
(Z-3)	lb.	.07	.085
(Z-6)	lb.	.08	.095
S. O. S.	gal.	.29	.34
Piccocizers	lb.	.05	.07
Piccolastic Resins	lb.	.16	.25
Piccolyte Resins	lb.	.205	.245
Piccopale Resins	lb.	.12	.135
Piccovars	lb.	.165	.20
Piccovol	lb.	.025	.038
Pictar	gal.	.25	.48
Pigmentar	lb.	.046	.0634
Pigmentaroil	lb.	.046	.0634
Pitch, Burgundy, Sunny South	lb.	.103	.1085
Pitt-Consol 500	lb.	.28	.305
640	lb.	.42	
Plasticizers			
42	lb.	.34	.40
84	lb.	.25	.29
B	lb.	.35	.45
DP-520	lb.	.435	.455
MP	lb.	.035	.0755
MT-511	lb.	.6925	.7425
ODN	lb.	.35	.475
SC	lb.	.38	.55
Plastoflex #3	lb.	.52	.57
#520	lb.	.36	.435
DBE	lb.	.50	.55
MGB	lb.	.29	.37
SP-2	lb.	.43	.48
VS	lb.	.3575	.3975
Plastogen	lb.	.0875	.09
Plastone	lb.	$0.25	$0.32
Polycin 470	lb.	.325	.34
Polycizers	lb.	.25	.415
.62	lb.	.25	.405
Polymel-C	lb.	.1775	.1875
C-130, DX	lb.	.1375	.1475
D	lb.	.225	.235
D-TAC	lb.	.1975	.215
Poly-Sperse AP-2	lb.	.23	.295
AP-300	lb.	.26	.325
LC-20	lb.	.26	.325
R-100	lb.	.17	.235
PT Pine Tars	lb.	.038	.0554
101 Pine Tar Oil	lb.	.038	.0554
Reogen	lb.	.1425	.145
Resin C pitch	lb.	.0225	.031
Resin R6-3	lb.	.38	.40
Resinex 10, 25, 50, 110	lb.	.04	.045
70	lb.	.0325	.0375
85, 100	lb.	.035	.04
115	lb.	.0375	.0425
L-2, L-3, L-4, L-5	lb.	.0225	.03
Rosin Oil, Sunny South	gal.	.58	.76
RPA No. 2	lb.	.85	
3	lb.	.51	
Conc.	lb.	.85	
6	lb.	1.66	
RSN Flux	gal.	.10	.91
Rubber Oil B-5	lb.	.0225	.0355
Rubberol	lb.	.18	.2725
Santicizer 1-H	lb.	.50	.52
8	lb.	.43	.47
9	lb.	.42	.44
140	lb.	.325	.36
141	lb.	.34	.375
160	lb.	.25	.29
409	lb.	.39	.42
603	lb.	.245	.285
B-16	lb.	.4475	.4775
E-15	lb.	.51	.54
Santocizer	lb.	.4275	.4575
Sebacic acid, purified, comml.	lb.	.59	.65
Binney & Smith	lb.	.64	.76
C. P.-Binney & Smith	lb.	.72	.84
Harchem	lb.	.655	.815
Sherolatum Petroleum	lb.	.05	.10
Softener #20	gal.	.10	.20
Special Rubber Resin 100	lb.	.1675	.2175
Staflex AX	lb.	.43	
DBES	lb.	.61	.635
Syn-Tac	gal.	.33	.635
Synthol	lb.	.17	.2625
Tetraflex R-122	lb.	.245	.285
Thiokol TP-90B	lb.	.59	
-95	lb.	.65	
Triacetin	lb.	.37	.41
Tributyl phosphate	lb.	.50	.535
Tributyrin	lb.	.69	
Tricresyl phosphate, comml.	lb.	.33	.36
Monsanto	lb.	.325	.36
Naugatuck	lb.	.33	.36
PX-917	lb.	.33	.36
Triphenyl phosphate, comml.	lb.	.39	.40
Monsanto	lb.	.415	.435
Turgum S	lb.	.156	.166
SB	lb.	.105	.115
Turpol NC 1200	lb.	.61	.70
Tysonite	lb.	.3025	.305
United	gal.	.69	1.20
X-1 Resinous Oil	lb.	.0225	.0325

Reclaiming Oils

Bardol, 639	lb.	.0275	.0375
B	lb.	.055	.065
BRH 2	lb.	.0213	.0351
BRT 3	lb.	.02	.031
4	lb.	.02	.031
7	lb.	.035	.036
BRV	lb.	.0625	.065
Burco-RA	lb.	.053	.0805
BWH-1	lb.	.16	.17
Dipolymer Oil	gal.	.33	.48
Dispersing Oil No. 10	lb.	.06	.0625
G. B. Oils	gal.	.115	.275
Heavy Resin Oil	lb.	.0225	.0375
LX-572	gal.	.27	.32
-759	gal.	.1375	
-777, -809, -859	gal.	.23	.33
-869	gal.	.33	.43
-871	gal.	.34	.44
No. 3186	gal.	.28	.295
Picco 6535	gal.	.25	.30
C-33	gal.	.215	.385
-42	gal.	.23	.44
D-4	gal.	.27	.37
E-5	gal.	.25	.35
Q-Oil	gal.	.286	.36
Pitt-Consol 500	lb.	.28	.305
640	lb.	.42	
PT 101 Pine Tar Oil	lb.	.038	.0554
Reclaiming Oil #3186	gal.	.28	.385
-G	gal.	.25	.365
4039-M	gal.	.3275	.3975
-Y	gal.	.30	.37
RR-10	lb.	.37	
S. R. O.	lb.	.015	.0225
X-1 Resinous Oil	lb.	.0225	.0325

Reinforcers, Other Than Carbon Black

Angelo Shellacs	lb.	.485	.7325
Borden, Chem. Div.			
Arcco 978-42B	lb.	.18	.19
1073-18B	lb.	.135	.145
1294-36B	lb.	.115	.125
1301-12B	lb.	.15	.16
BRC-20	lb.	$0.0235	$0.0245
22	lb.	.026	.0285
30	lb.	.0165	.025
521	lb.	.023	
Bunarex Resins	lb.	.085	.095
Cab-o-sil	lb.	.66	1.45
Calcene CO	ton	105.00	125.00
NC	ton	80.00	100.00
TM	ton	82.50	102.50
Car-Bel-Rez C	lb.	.126	.1451
Clays			
Aiken	ton	14.00	
Buca	ton	45.00	
Burgess Iceberg	ton	50.00	80.00
Icecap K	ton	65.00	90.00
Burgess Pigment #20	ton	35.00	60.00
#30	ton	37.00	60.00
Catalpo	ton	35.00	
Crown	ton	14.00	33.00
Dixie	ton	14.50	15.00
Franklin	ton	13.50	35.25
L. G. B.	ton	13.00	17.50
McNamee	ton	14.50	15.00
Par	ton	13.00	13.50
Paragon	ton	10.00	14.50
Pigment No. 33	ton	37.00	
Polyfil	ton	25.00	45.00
Polyfil C	ton	25.00	
Recco	ton	14.00	
Suprex	ton	10.00	14.50
Swanee	ton	12.50	
Whitetex	ton	50.00	
Windsor	ton	14.00	30.00
Witco No. 1	ton	14.00	30.00
No. 2	ton	13.50	30.00
Clearcarb	lb.	.1175	.1255
Cumar Resins	lb.	.095	.19
Darex Resins	lb.	.42	.49
DC Silica	lb.	1.15	1.40
Diatomaceous silica	ton	32.00	48.00
Good-rite 2007	lb.	.36	.38
2057	lb.	.30	.31
Hi-Sil 233	lb.	.0825	.0975
X303	lb.	.40	.45
Hycar 2001	lb.	.55	
2007	lb.	.39	
Indulins	lb.	.06	.08
Kralac A-EP	lb.	.43	.54
Laminar	ton	30.00	
Magnesium carbonate			
DCI	lb.	.11	
Marinco CL	lb.	.11	.14
Marbon Resins	lb.	.36	.43
Multifex MM	ton	117.50	137.50
Super	ton	167.50	187.50
Neville Resins			
465	lb.	.075	.08
LX-509	lb.	.33	.35
Nebony	lb.	.045	.05
Paradene	lb.	.07	.08
R	lb.	.145	.205
Para Resins 2457	lb.	.04	.045
Parapol S-Polymers	lb.	.44	
Picco Resins	lb.	.0875	.19
Piccolyte Resins	lb.	.2225	.2525
Piccoumaron Resins	lb.	.0875	.19
Piccovars	lb.	.145	.20
Pliolite NR types	lb.	.98	1.33
S-3	lb.	.42	.49
-6	lb.	.36	.43
B	lb.	.36	.43
E	lb.	.36	.43
Plio-Tuf G85C	lb.	.52	.59
Purecal M	ton	56.75	71.75
SC, T	ton	110.00	125.00
U	ton	120.00	135.00
R-B-H 510	lb.	.15	.22
Resinex	lb.	.0375	.0525
Rubber Resin LM-4	lb.	.28	.35
Silene EF	lb.	.06	.07
L	lb.	.0575	.0675
Silvacons	ton	55.00	85.00
Transphalt	lb.	.0375	.0575
Witcarb P	ton	117.50	153.50
R	ton	127.50	163.50
Regular	ton	60.00	96.00
Zeolex 23	lb.	.06	.07
Zinc oxide, commercial†	lb.	.145	.155

Retarders

Benzoic acid TBAO-2	lb.	.44	
Good-rite Vultrol	lb.	.62	.66
R-17 Resin	lb.	.1075	.36
Retarder ASA	lb.	.57	
E-S-E-N	lb.	.39	.41
J	lb.	.68	.70
PD	lb.	.39	.41
W	lb.	.46	
Retardex	lb.	.47	.50
Thionex	lb.	1.14	
Wiltrol P	lb.	.37	.39

Solvents

Bondogen	lb.	.555	.605
Butyrolactone	lb.	.60	.65
Cosol #1	gal.	.37	.43
#2	gal.	.42	.48
Dichloro Pentanes	lb.	.04	.07
Dipentene DD, Sunny South	gal.	.42	.63
Ethylene dichloride, comml.	lb.	.09	.122
Hi-Flash 2-50-W	gal.	.41	
Pale yellow	gal.	.39	
LX-572	gal.	.27	.32
-748	gal.	.16	.23
Methyl-2-pyrrolidone	lb.	.75	.80
Neville Nos. 100, 104	gal.	.52	.60
106	gal.	.38	.46
Nevsolv H, 200	gal.	.19	.29
HF, T, 30	gal.	.24	.34

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Penetrell	gal.	$0.42 /	$0.63
Picco Hi-Solv Solvents	gal.	.16 /	.48
Pine Oil DD, Sunny South	lb.	.15	
Skellysolve-B	gal.	.17	
-C	gal.	.162	
-H	gal.	.148	
-R, -V	gal.	.139	
Stauffer Carbon Disulfide	lb.	.0525/	.085
Tetrachloride	lb.	.0825/	.475

Tackifiers

Actinol DLR	lb.	.0625/	.085
Bardol, 639	lb.	.0275/	.0375
Borden, Arcco			
A25, A26, 716-30	lb.	.18 /	.19
555-40R	lb.	.185 /	.205
620-32B	lb.	.20 /	.21
716-35	lb.	.17 /	.18
1041-21	lb.	.165 /	.175
BRH 2	lb.	.0213/	.0351
Bunarex Resins	lb.	.065 /	.1225
Bunaweld 480	lb.	.24	
Chlorowax 70	lb.	.18 /	.24
Contogums	lb.	.0875/	.11
Cumar Resins	lb.	.095 /	.19
Galex W-100	lb.	.155 /	.17
W-100D	lb.	.1525/	.1625
Indopol H-35	gal.	.65 /	.84
H-50	gal.	.70 /	.89
-100	gal.	.85 /	1.08
-300	gal.	1.00 /	1.24
-1500	gal.	1.48	
L-10	gal.	.40 /	.59
-50	gal.	.45 /	.64
-100	gal.	.55 /	.74
Kenflex resins	lb.	.18 /	.27
Koresin	lb.	.90 /	1.10
Natac	lb.	.1685/	.1785
Nevindene	lb.	.15 /	.18
Picco Resins	lb.	.0875/	.19
Piccolastic Resins	lb.	.1855/	.34
Piccolyte Resins	lb.	.2225/	.2525
Piccopale Resins	lb.	.089 /	.13
Piccoumaron Resins	lb.	.0875/	.19
R-B-H 510	lb.	.15 /	.22
Roelflex 1118A	lb.	.39	
Synthetic 100	lb.	.41	
Synthol	lb.	.17 /	.2625
United	gal.	.69 /	1.20
Vistanex, LM grades	lb.	.45	

Vulcanizing Agents

Dibenzo G-M-F	lb.	2.60	
G-M-F #113, #117	lb.	.90	
Di-Cup	lb.	$1.10	
Dodecenylsuccinicanhydride	lb.	.75 /	$0.76
HMDA-Carbamate	lb.	4.50 /	4.90
Ko-Blend I, S	lb.	.39	
Litharge (*See Accelerator-Activators, Inorganic*)			
Magnesium oxide	lb.	.2525/	.38
DCI	lb.	.215 /	.235
601	lb.	.2525	
Maglite D, K, Y	lb.	.2525/	.305
L	lb.	.2975/	.3225
M	lb.	.27 /	.32
Marmag	lb.	.2475/	.295
Michigan No. 1782	lb.	.2525/	.30
PSD 85	lb.	.37 /	.50
Red Lead (*See Accelerator-Activators, Inorganic*)			
Seamag	lb.	.20 /	.22
Sulfasan R	lb.	1.55	
Sulfur flour, comml.	100 lbs.	2.55 /	3.30
1018	lb.	.12 /	.1575
Aero	100 lbs.	2.40 /	7.75
Crystex	lb.	.195 /	.23
Insoluble 60	lb.	.125 /	.13
Rubbermakers	100 lbs.	2.65 /	4.55
Stauffer	lb.	.0265/	.054
Telloy	lb.	4.00	
VA-7	lb.	.50	
Vandex	lb.	7.00	
Vultac No. 2	lb.	.47 /	.74
3	lb.	.51 /	.78
White lead silicate (*See Accelerator-Activators, Inorganic*)			

Synthetic Rubbers

(Continued from page 132)

Synpol 8200	.191[b] /	.197[b]
8201, 8208	.175[b] /	.181[b]
8202	.1725[b]/	.1785[b]

Cold SBR Oil-Black Masterbatch

Ameripol 1805	.155[c] /	.161[c]
4750	.1545[c]/	.1605[c]
4751	.140[c] /	.146[c]
4753	.148[c] /	.154[c]
4759	.16 /	.166
4760	.1576[c]/	.1636[c]
4761	.171[c] /	.177[c]
Baytown 1801		$0.176[b]
Carbomix 3751, 3758	$0.1545[c]/	.1605
3753,	.164[c] /	.170[c]
3757	.148[c] /	.154[c]
3760-NS	.1496[c]/	.1556
Gentro-Jet 9250		.158
9251		.164
9252		.167
9275		.150
OB-102		.1825[a]
-104		.1475[a]
-110		.141[a]
Philprene 1803	.174[b] /	.18[b]
1805	.155[b] /	.161[b]
6604	.208[b] /	.214[b]
6608	.146[b] /	.152[b]
6661	.182[b] /	.188[b]
6662	.1845[b]/	.1905[b]
6682	.148[b] /	.154[b]
S-1800		.1475[a]
-1802		.141[a]
-1803		.165[a]
-1806		.151[a]
-1807		.154[a]
-1808		.142[a]
Synpol 8253	.1584[b]/	.1644[b]
8254	.1545[b]/	.1605[b]
8255	.148[b] /	.154[b]
8267	.164[b] /	.17[b]

Cold SBR Rosin Masterbatch

Copo 3900	.231[c] /	.237[c]

Cold SBR Latex

CL-101		.28[c]
Copo 2101	.30[c] /	.4025[c]
2102, 2105, 2110	.32[c] /	.3725[c]
2108	.30[c] /	.3675[c]
2109	.2775[c]/	.3450[c]
3852	.30[c]	
FR-S-2105	.32[c] /	.366[c]
Naugatex 2105, 2107	.32[c] /	.38[c]
2108	.30[c] /	.38[c]
2113	.29[c] /	.36[c]
Pliolite Latex 2101		.30[c]
2105 2107		.32[c]
2108		.30[c]
Polysar Latex 721		.32[c]
S-2101		.26[c]
-2105		.28[c]
-2107		.32[c]
-2108		.29[c]

Misc. SBR

FR-S-110 (latex)	.3000[c]	
-150 (latex)	.3000[c]	
-174 (latex)	.2950[c]	
-176 (latex)	.2775[c]	
-182	.241[c] /	.247[c]
-184	.1885[c]/	.1945[c]

Urethane Types

Adiprene L, LD-167,-213	1.15 /	1.65

Pelletized News

(Continued from page 124)

KANEGAFUCHI CHEMICAL CO., Japan, has erected a pilot plant for the manufacture of neoprene-type synthetic rubber. On the results obtained depends government approval of a technical tie-up between Showa Denko and Du Pont, it is reported.

SOCIETE D'ENTREPRISES MARITIMES & TERRESTRES (S.E.M.E.T) is using a specially designed tank barge to increase efficiency in unloading and storing bulk latex in the port of Le Havre. The barge is permanently moored in the port and is moved only when required to go alongside a vessel to take over a cargo of bulk latex. This barge then returns to its mooring station from where the latex is later forwarded by truck, tank trucks, etc. The barge is fitted with its own tanks and necessary equipment for emptying them by compressed air. The stored latex is kept at a regular, normal temperature by carefully controlled heating of the inside atmosphere.

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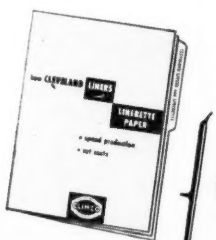

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